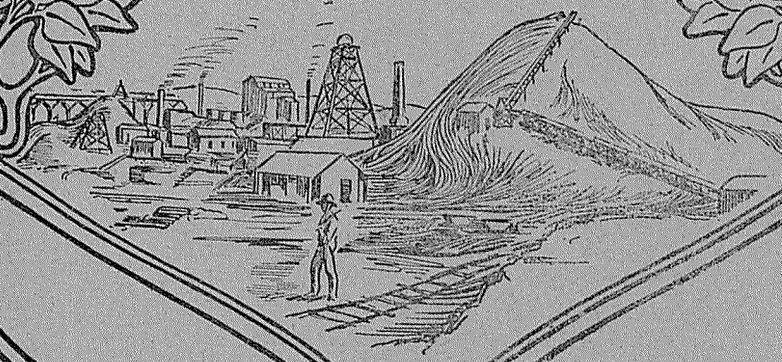
REPORT
OF THE
DEPARTMENT OF MINES
FOR THE YEAR
WESTERN · 1929. · AUSTRALIA



PRESENTED · TO · BOTH · HOUSES · OF · PARLIAMENT · BY · HIS · EXCELLENCY'S · COMMAND ·

1930.

WESTERN AUSTRALIA.

REPORT

OF THE

DEPARTMENT OF MINES

FOR THE YEAR

1929.

Presented to both Houses of Parliament by His Excellency's Command.

[FIRST SESSION OF THE FOURTEENTH PARLIAMENT.]

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ANNUAL REPORT OF THE DEPARTMENT OF MINES, WESTERN AUSTRALIA, 1929.

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DIVISION I.

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DIAGRAM.

of Gold output showing the amount in fine ounces of Gold exported & received at the Perth Mint from the Year 1901 onwards.

1929

Note:– Previous to 1901 Gold Produced, 5,293,885·66 Fine Ozs.

STATE OF WESTERN AUSTRALIA.

Report of the Department of Mines for the State of Western Australia for the Year 1929.

To the Hon. the Minister for Mines.

Sir,—

I have the honour to submit the Annual Report of the Department for the year 1929 with summaries of reports from the Wardens and other officers, together with various comparative tables furnishing statistics relating to the Mining Industry of the State.

Reports from the officers controlling the various sub-departments are also submitted.

I have, etc.,

M. J. CALANCHINI,

Under Secretary for Mines.

Department of Mines,

Perth, 31st March, 1930.

Table showing Results of Miners' Phthisis Examinations from inception of Act to 31st December, 1929:—

Examinations.	Normals, etc.	Miners' Phthisis Early.	Miners' Phthisis Advanced.	Miners' Phthisis Plus Tuberculosis.	Tuberculosis only.	Total No. of men examined.
First Examination (1925–26)	3,239	459	183	131	11	4,023
	% 80·5	% 11·4	% 4·5	% 3·3	% ·3	
Second Examination (1927)	3,116	381	93	128	10	3,728
	% 83·6	% 10·2	% 2·5	% 3·4	% ·3	
Third Examination (1928)	2,977	362	98	42	4	3,483
	% 85·5	% 10·4	% 2·8	% 1·2	% ·1	
Fourth Examination (1929)*	2,120	326	94	41	7	2,588
	% 81·9	% 12·6	% 3·6	% 1·6	% ·3	

* *Note.*—No examinations at the outlying Goldfields were carried out this year, only the men employed in the Mines in Kalgoorlie and surrounding districts being examined.

The 2,120 cases reported as normals, etc., during the 1929 examination, comprise 2,099 who were previously reported as normals, etc., and 21 new cases, that is, cases examined for the first time.

Of the 326 cases of Miners' Phthisis Early, 224 were previously reported as Miners' Phthisis Early, 100 as Normals, etc., and two are new cases. With regard to the 100 cases previously reported as Normals, etc., the Medical Officer in charge of the Laboratory explained that only 26 out of these 100 cases had actually advanced from Normal, etc., to Miners' Pthhisis Early since their previous examination, and that in the remaining 74 cases the silicotic condition existed in previous films, but was only detected during the 1929 re-examinations, owing to the installation at the Laboratory of an improved type of X-ray tube, by means of which detail in the films was made clearer, leading to the recognition of silicosis (Miners' Phthisis) in cases which previously appeared more or less normal.

Of the 94 cases of advanced Miners' Phthisis, 34 were previously reported as Miner's Phthisis Early and 60 as Miners' Phthisis Advanced.

The 41 cases of Miners' Phthisis plus Tuberculosis comprised eight cases previously reported as Normals, etc., 14 as Miners' Phthisis Early and 19 as Miners' Phthisis Advanced.

The seven cases of Tuberculosis only were all previously reported as Normals, etc.

It may be pointed out in connection with the 1929 Examination that the figures only represent the results of the re-examination of the mines in the Kalgoorlie and surrounding districts, embracing Coolgardie, Ora Banda, Menzies, and Mt. Monger, it having been found necessary to postpone the re-examination of the mines in the outlying goldfields, including Mt. Margaret, Murchison, East Murchison, Dundas, and Yilgarn, until next year, owing to the inability of the Commonwealth Health Department to secure a suitable medical officer to relieve the Medical Officer in Charge of the Commonwealth Health Laboratory, Kalgoorlie.

Taking into consideration the above explanation of the Medical Officer in Charge of the Commonwealth Health Laboratory, Kalgoorlie, and the fact that the great majority of men examined during 1929 were employed in the deep mines in the Kalgoorlie district, the figures for 1929 compare favourably with those for 1928, although the percentages are apparently higher.

With the withdrawal of the tuberculosis men from the mines, however, combined with the improved standard attained in the mines during the past few years, as regards dust and ventilation, it is anticipated that the results of next year's examinations will show a considerable improvement on those of previous years.

Since the Miner's Phthisis Act came into operation on the 7th June, 1925, 374 men have been reported to be suffering from Tuberculosis. Of this number, 128 have died, 137 are totally incapacitated from work, 3 have been repatriated, 2 are pending medical examination as to their fitness for other suitable employment, 2 cases are being investigated as to whether they come within the Act, 69 are fit for ordinary or light work and have been placed in suitable occupations, and 33 do not come within the provisions of the Act.

The number of beneficiaries in receipt of compensation in respect of themselves and their dependants is 277, and the total amount of compensation paid since the inception of the Act to the 31st December, 1929, is £127,302, and the incidental expenditure £6,565. The number of dependants of the deceased and totally incapacitated men still eligible for compensation is 356, comprising 84 wives, 64 widows, and 208 children under 16 years of age, while the dependants of the men who are fit for work number 117, including 45 wives, 71 children and 1 mother.

In the East Murchison Field there was a decrease.

In the Black Range District there was a decrease.

COMPARATIVE STATISTICAL DIAGRAMS

RELATING TO

OUTPUT AND VALUE OF GOLD AND OTHER MINERALS, LANDS LEASED FOR GOLD MINING

IN WESTERN AUSTRALIA

AND THE GOLD PRODUCTION OF AUSTRALASIA FOR THE YEAR 1929

FIG. 1.

Output of Gold from various Goldfields as reported to Mines Dept.

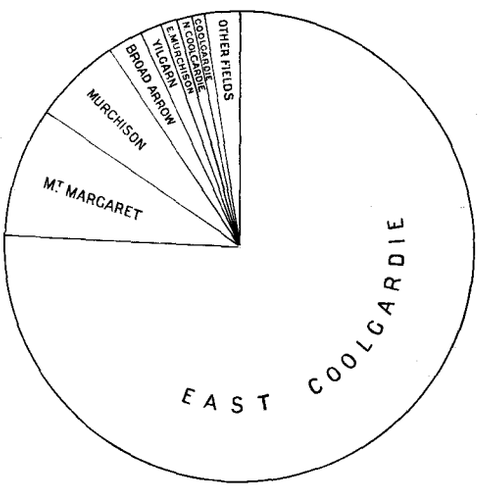


FIG. 2.

Gold produced from various Goldfields as given by the Export and Mint Returns.

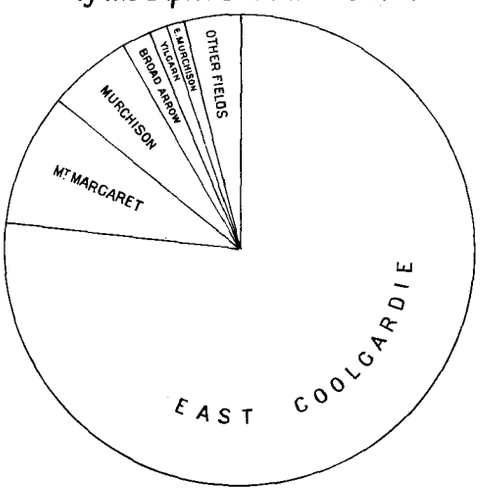


FIG. 3.

Value of Gold and other Minerals.

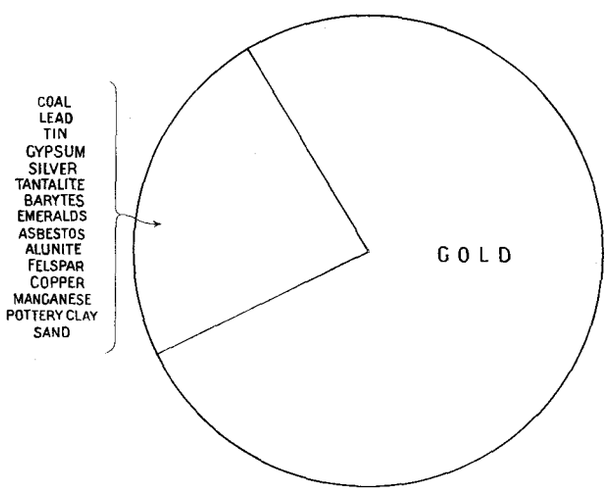


FIG. 4.

Value of Minerals other than Gold.

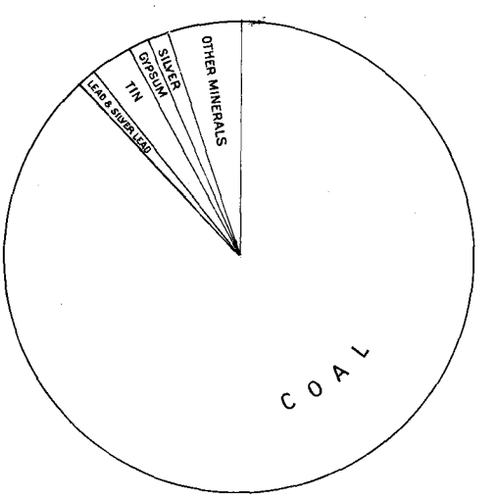


FIG. 5.

Areas of Land leased for Goldmining on various Goldfields.

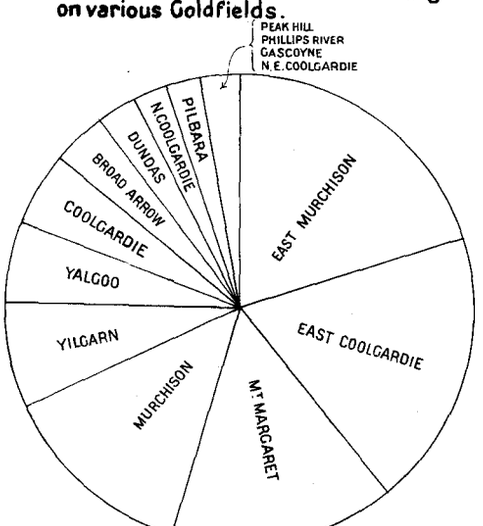
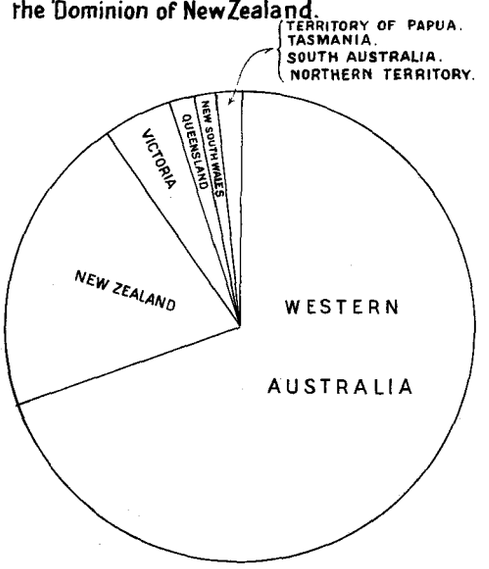


FIG. 6.

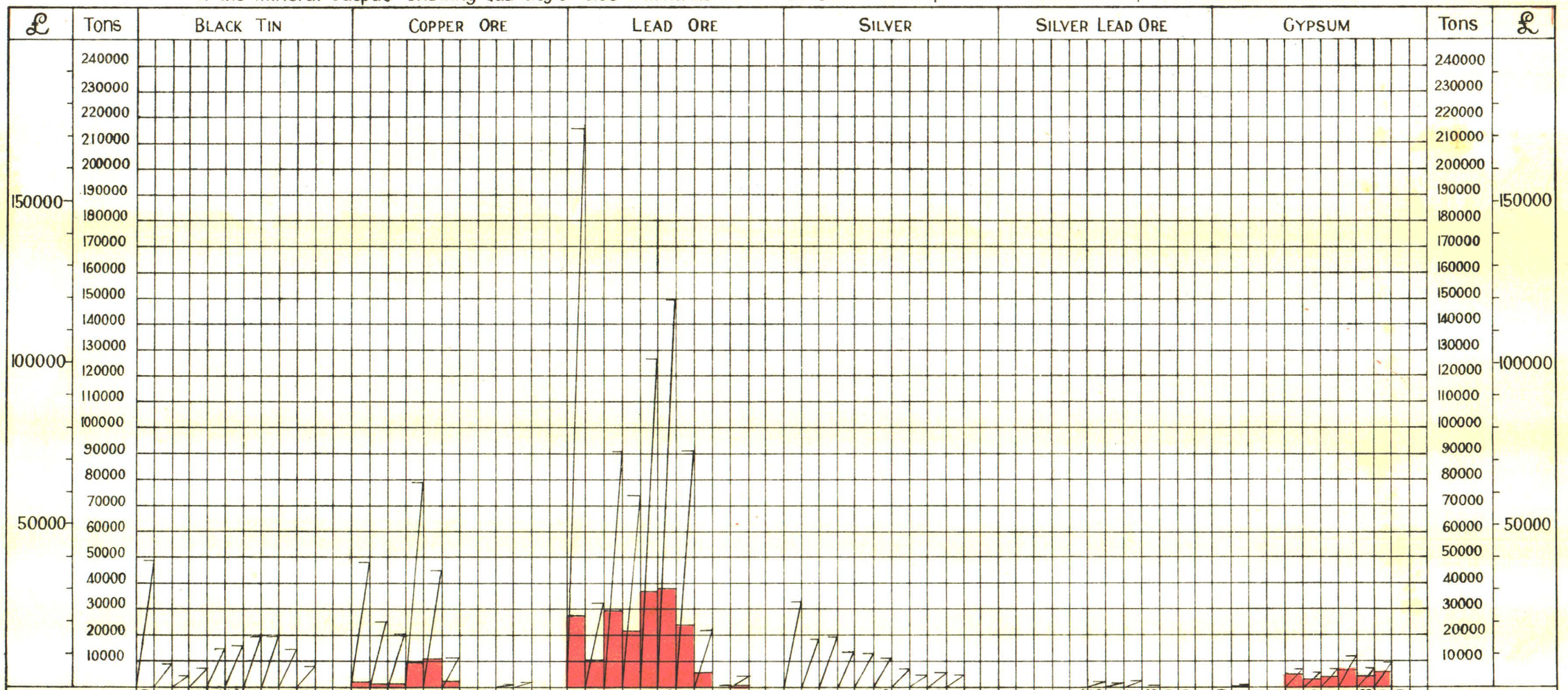
Output of Gold in the States of Australia and the Dominion of New Zealand.



1929

DIAGRAM

of the Mineral Output - shewing Quantity & Value of Minerals other than Gold & Coal reported to the Mines Dep[t] from the Year 1920 onwards



NOTE:- The Pink denotes Quantities produced & Diagonal lines Values thereof

Minerals not shown above

Tantalite 12 tons Value £3668
Asbestos 255 " " £14,682
Emeralds " £ 278

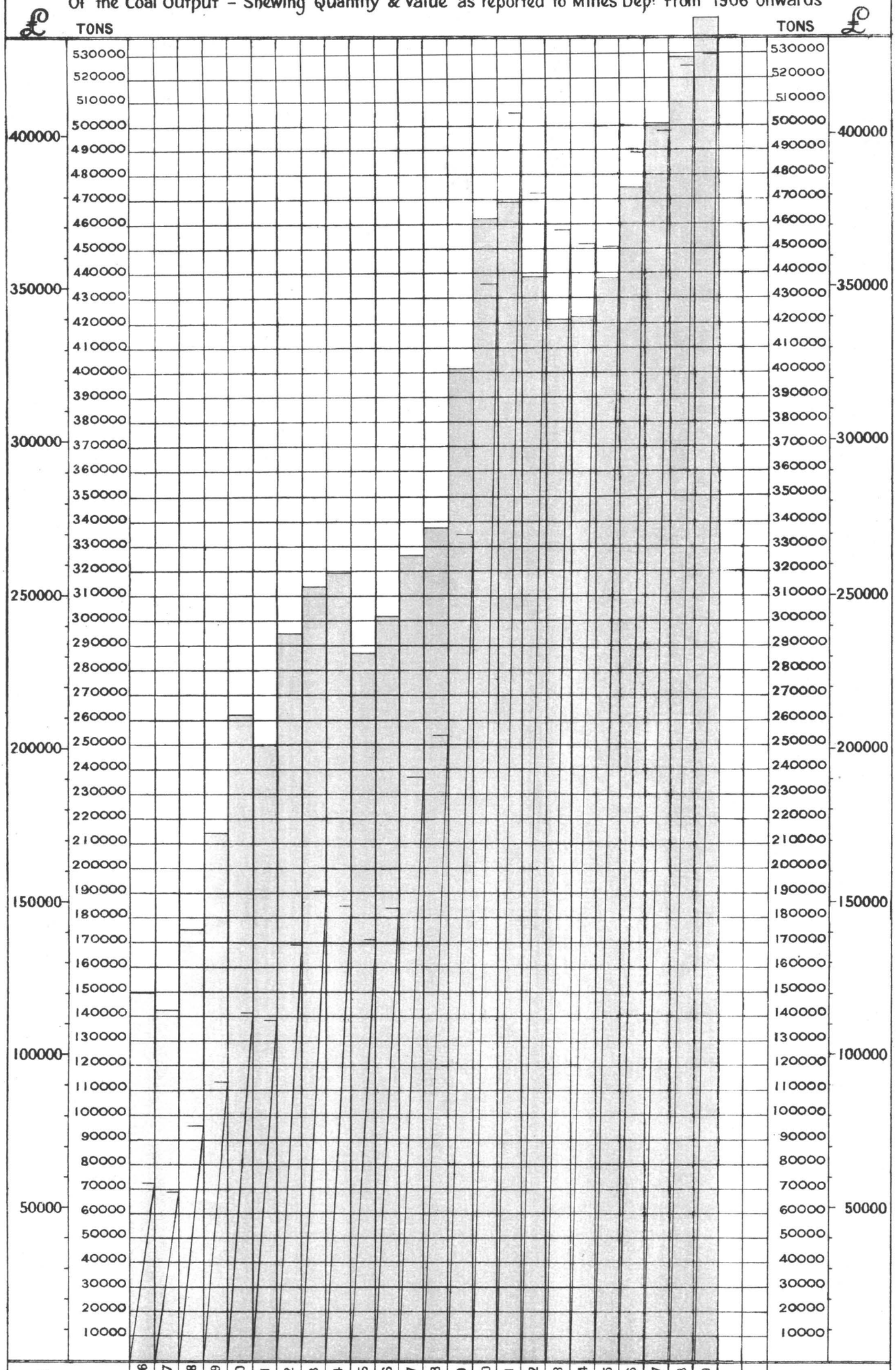
Previous to 1920 the Quantity & Value of various Minerals reported amounted to

Black Tin	16043 Tons	£1,373,883	
Copper	225824 "	1,562,440	
Ironstone	57830 "	36,695	
Lead	213451 "	626,604	
Asbestos	96 "	3,197	
Pyritic Ore	58,470 "	26,146	
Silver Lead	2884	£ 33,987	
Tantalite	102	15,268	
Limestone	93706	18,290	
Silver	2122812 Ozs	280,572	
Other Minerals		3,905	

1929

DIAGRAM

Of the Coal Output – Shewing Quantity & Value as reported to Mines Dept from 1906 onwards



Year		1906	1907	1908	1909	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	Year
Value	£	57998	55158	75694	90965	113699	111154	135857	153614	148684	137589	147823	191822	204319	270355	350346	407117	381555	368949	363255	363203	394400	407967	420145	426706	£ Value
Quantity	Tons	149765	142373	175248	214302	262166	249890	295079	313818	319210	286666	301526	326550	337039	401713	462021	468 817	438443	420714	421864	437461	474819	501505	528420	544719	Tons Quantity

1929

At Montague the production was good and outputs were also reported from Maninga Marley, Sandstone, Youanmi, Curran's Find and Hancocks. The centres of Birrigrin and Barambie are both deserted.

In the Lawlers district mining was exceedingly quiet. The only production was from cyanide treatment of sands and slimes. No crushings were reported.

In the Wiluna district there was a small increase. Returns were reported from Coles Find, Mount Hilda, and Diorite. At Wiluna development work and erection of plant on the property of the Wiluna Gold Mines proceeded vigorously. The production stage is hoped to be reached before long. The completion of the railway to this centre has been of great benefit.

The Murchison field had a decrease.

In the Meekatharra district the output was slightly smaller.

The principal producer was the Ingliston Consols, and most of the production came from mines in the immediate vicinity of Meekatharra.

The outlying centres were very quiet.

In the Cue district there was a falling-off, and practically no improvement in mining.

In the vicinity of Cue a good deal of prospecting was going on. At Cuddingwarra the boring done on the "Big Bell" gave very encouraging results, and it is expected that capital will be forthcoming for further development. At Reidy's work is suspended on the Mararoa Company's leases owing to want of capital, a position that it is hoped will be overcome shortly.

At Poona mining for emeralds is still going on, efforts being directed to proving the lode at depth.

In the Day Dawn district there was a small increase, but nothing of note transpired. The chief producers were the "Mountain View" at Day Dawn and the "Mainland Consols" at Lake Austin.

In the Mount Magnet district there was also an increase. Most of the output was from the vicinity of Mount Magnet. At Lennonville there was a small production, but nothing was reported from Moyagee or Paynesville.

The Peak Hill Field had a slight increase. Most of the output came from mines in the vicinity of Peak Hill. At all the outside centres the amount of prospecting going on was very limited. The railway to the Manganese Deposits at Horseshoe was completed, but, consequent on the low price ruling for this mineral, no work is being done on them.

The Yalgoo Field had a decrease.

This is the result of the closing down of the Brilliant Mine at Messenger's Patch. At Goodingnow the "Lake View" was producing, but apart from this only a few prospectors were at work. At the other centres there was little alteration and nothing of note reported.

The Mount Margaret Field recorded a decrease.

In the Mount Margaret district there was a small decrease. Nothing of note transpired, and only a few prospectors were operating at the various centres.

In the Mount Morgans district there was also a decrease, but the tonnage treated was greater. The chief production was from the Westralia Mount Morgans Mine.

In the various centres a few prospectors were working.

In the Mount Malcolm district there was a small increase. Practically all the output came from the Sons of Gwalia Mine, which throughout the year was actively worked and is developing very promisingly. Only a small amount of prospecting was in evidence in this district, and no new discovery was reported.

The Coolgardie Field showed a falling-off. This is consequent on poor returns from the St. Ives and Kunanalling centres.

At the former mining is practically at a standstill, and at the latter only a couple of mines are working. At Gibraltar some good returns were reported from the old "Lloyd George" Mine.

At Widgiemooltha a few prospectors were working, but nothing of note discovered.

At Burbanks nothing was being done, but it is expected capital will shortly be forthcoming for the resumption of operations. In the immediate vicinity of Coolgardie a good deal of prospecting was being done.

The North Coolgardie Field had a decrease.

In the Menzies district there was a decrease, largely owing to a very small output from the Sand Queen-Gladsome Mine at Comet Vale, but an improvement in this regard is anticipated.

At Menzies itself several good crushings were reported.

At Goongarrie and Mount Ida practically no mining was going on.

In the Ularring district almost the only work in evidence was diamond drilling by the Government on the Riverina South, and which is still in hand at the close of the year.

At the State Battery at Mulline there was a small production from the treatment of sands.

In the Yerilla district there were small outputs from the "Neta" and "Golden Heart" at Edjudina.

At Pingin there was some activity in prospecting, but at Yerilla and Yarri mining is moribund.

In the Niagara district a little prospecting was going on. The locality known as Twin Hills, where a discovery was made and referred to in last year's Report, was found to be in the Menzies district. A few good returns were got from some of the properties there.

The North-East Coolgardie Goldfield had a decrease. Only a few prospectors are working in this field. A discovery was reported from a locality between Bulong and Kanowna, and although several areas were taken up, the only gold recovered was from the original blocks. In the Kurnalpi district mining was stagnant. Very few men were at work, and the return was small.

The Broad Arrow Field had an increase, the result of the resumption of operations on the Associated Northern Blocks Mine, at Ora Banda. From a new discovery at Canegrass a good crushing was reported. Good returns were also got at Dark Horse, Waverley, and Windanya.

In the various centres systematic prospecting was being done by a large number of men.

In the East Coolgardie Goldfield the number of men engaged in mining was 2,072, and in 1928, 1,981; an increase of 91. This goldfield gave employment to over 50 per cent. of the number of men employed in gold mining, and the reported production during the year was 282,550 fine ounces, over 75 per cent. of the total reported yield.

The tonnage treated was 637,361 tons, being 4,191 tons less than in 1928.

The yield showed a decrease of 12,405 fine ounces on the preceding year. The average grade of the ore per ton fell from 56.64 shillings in 1928 to 52.48 shillings in 1929. Production by most of the large mines was maintained, the principal contributors being the Lake View and Star and the Great Boulder. During the year the former acquired the properties held by the Golden Horseshoe Company, and it is expected that a large developmental scheme will be launched shortly.

The North Kalgurli Company again entered the list of producers. In November a cyclonic disturbance did considerable damage to several mines and caused a temporary suspension of work on some of them.

A large number of tributers have been working, and many have had good returns.

At the North end of the field prospecting was very active.

At Feysville several parties were working, and some good crushings got.

In the Bulong district good returns were reported from Mount Monger, where mining was active. Elsewhere only a few prospectors were at work.

In the Yilgarn Goldfield there was a decrease.

At Bullfinch mining was fairly active.

At Manxman the Radio and Radio Deeps were steady producers, and this centre accounted for more than half of the output.

At Westonia mining was active, and there was a satisfactory production. At Burbidge, Marvel Loch, Holleton and other centres, including the immediate vicinity of Southern Cross, matters were very quiet, and only a few prospectors were operating.

In the Dundas Field there was a decrease.

The owners of a couple of properties are very optimistic as to their future, but generally speaking there was little change in the field.

The Phillips River Field had a small increase. The only gold mining was in the Kundip centre, and only a few properties were being worked. Copper mining was also moribund, due to the low market price ruling. The outlook for this field is not promising.

In the Northern Goldfields, Kimberley, West Kimberley, West Pilbara, Ashburton and Gascoyne, no development of note was reported.

In the Pilbara Feld there was an increase, but gold mining did not show much improvement.

TIN.

The quantity of Tin exported was 77 tons, valued at £13,432, a decrease in tonnage of 8 tons, and in value of £1,570.

The Greenbushes Tinfield produced 38.30 tons, valued at £4,079, a decrease in tonnage of 16.24 tons, and in value of £2,276.

The Pilbara Field produced 17.86 tons, valued at £2,531, a decrease in tonnage of 17.62 tons, and in value of £2,640.

TANTALITE.

The production of 11.27 tons, valued at £3,598, was reported from the Pilbara Field, an increase on the previous year in tonnage of 2.51 tons, and in value of £1,385. Also .30 of a ton from the Greenbushes Field, valued at £70, but none in the preceding year.

COPPER.

The reported production was 116 tons from the Northampton Field, valued at £974, and 33.18 tons, valued at £420, from the Phillips River Field. There was none reported from either field during the previous year.

COAL.

The output of Coal was 544,719 tons, being 16,299 tons more than in 1928. All the production was from Collie, where six (6) collieries were producing. No work was done on the deposits at Wilga. Some further boring was done on the deposits at Eradu, but nothing noteworthy was recorded. The number of men employed, 858, is greater by 60 than in 1928, and the output per man was, in 1928, 662 tons, and in 1929, 635 tons.

OIL.

Boring was continued on the area held by the Freney Kimberley Oil Company in West Kimberley, excepting for a period when operations were suspended to permit of an examination by the Commonwealth and State Geologists.

The indications of ultimate success are encouraging. No deep drilling for oil was done elsewhere in the State, but several areas were being prospected.

ASBESTOS.

The reported production was 63.70 tons, valued at £C,113, from the Pilbara Field, an increase in tonnage of 52 tons, and in value of £5,331, on the previous year; also from the West Pilbara Field 191.25 tons, valued at £8,568, but none in the previous year.

OTHER MINERALS.

The quantity of Silver obtained as a by-product and exported was 49,834 ounces, valued at £5,509, and in the preceding year 55,554 ounces, valued at £6,638, a decrease of 5,720 ounces, and in value of £1,129. Lead and Silver Lead amounting to 444 tons, valued at £7,016, an increase in tonnage of 196 tons, and in value of £2,818, was exported; also 38 tons of Alunite, valued at £194, 2 tons of Barytes, valued at £8, 21 tons of Felspar, valued at £96, 80 tons of Manganese, valued at £230, 2 tons of Pottery Clay, valued at £5, and 18 tons of Sand, valued at £36.

In addition, the production was reported of 5,289 tons of Gypsum, valued at £7,676, an increase in tonnage of 1,075 tons, and in value of £2,251; also Emeralds to the value of £278, and in the preceding year £910.

MINING GENERALLY.

The Western Australian production was 69.71 per cent. of the total for Australasia, and in the preceding year 68.27 per cent.

As hitherto, every possible assistance has been extended by the Government to the industry. Unfortunately, so far, the direct benefits have not been commensurate to the expenditure incurred. A large amount of diamond drilling was done, and in a couple of instances the results obtained are very promising.

The special relief accorded mine owners by the payment of their premiums to cover liability for occupational diseases under the Third Schedule of the Workers' Compensation Act was continued for the year, the amount paid to the 31st December being £36,590 15s. 7d.

The concessions in regard to reduced charges for water and for treatment of ore at State Batteries were also continued.

Geophysical investigations were carried out by one of the parties under the direction of the Commonwealth Council for Scientific and Industrial Research. The work done was confined to the Northampton Field and the results will not be published for some time.

The Department rendered a good deal of assistance to the party.

In mining for base metals the continued low prices ruling for most of them militated against any marked improvement. The assistance to prospectors, by way of sustenance, loans of equipment and transport facilities, was continued. The Board dealing with this activity granted 314 applications, representing 431 men, and approved of 210 extensions of existing cases, affecting 263 men. The expenditure involved was £8,462 14s. 4d., being £1,859 10s. 4d. in excess of that for the previous year.

From the 1st September, 1919, when the State Prospecting Board came into existence, 1,752 parties, embracing 2,731 men (including five specially selected State Prospecting Parties), have been assisted at a total cost of £63,233 11s. The assisted prospectors' operations extended throughout the mineral-bearing portions of the State, and several of them reported good crushings. Throughout the year weather conditions were generally favourable, although a few reports received made reference to scarcity of feed in certain localities towards the end of the year. This condition, however, was relieved by the occurrence of a general rainfall. The area under prospecting areas, for gold and minerals, apart from coal, viz., 8,745 acres, is 880 acres in excess of that held during the preceding year, an indication that interest in prospecting is well maintained. The expenditure incurred in rendering assistance to mine owners and the industry generally under the provisions if the Mining Development Act totalled £84,825 15s. 2d., and in the preceding year £80,666 4s. 3d.

In addition, guarantees were given to Banks on behalf of several mine owners, the liability of the Government at the close of the year in respect of these being £51,500.

PART II.—MINERALS RAISED.

TABLE 1.

Quantity and Value of all the Minerals produced during 1928 and 1929.

Description of Minerals.	1928.		1929.		Increase or Decrease for Year compared with 1928.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£
1. Alunite (exported) statute tons	...	...	38	194	+ 38	+ 194
2. Arsenical Ore (exported) statute tons	*	401	...	...	...	— 401
3. Asbestos (reported), statute tons	12	782	255	14,681	+ 243	+ 13,899
4. Barytes (exported), statute tons	...	...	2	8	+ 2	+ 8
5. Coal (raised), statute tons	528,420	420,145	544,719	426,706	+ 16,299	+ 6,561
6. Copper { Ore (exported), statute tons	100	765	129	2,778	+ 29	+ 2,013
6. Copper { Ingot, Matte, etc. (exported), statute tons	...	...	...	...	...	...
7. Emeralds (reported)	...	910	...	278	...	— 632
8. Felspar (exported), statute tons	...	...	21	96	+ 21	+ 96
9. Gold (exported and minted), fine ozs.	393,408	1,671,093	377,176	1,602,142	— 16,232	— 68,951
10. Gypsum (reported), statute tons	4,214	5,425	5,289	7,676	+ 1,075	+ 2,251
11. Iron (exported), statute tons	1	1	...	...	— 1	— 1
12. Lead and Silver Lead (exported), statute tons	248	4,198	444	7,016	+ 196	+ 2,818
13. Manganese (exported), statute tons	...	...	80	230	+ 80	+ 230
14. Pottery Clay (exported), cwts.	...	...	2	5	+ 2	+ 5
15. Sand (exported), statute tons	...	...	18	36	+ 18	+ 36
16. Silver (exported), fine ounces	55,554	6,638	49,834	5,509	— 5,720	— 1,129
17. Sulphur (exported), statute tons	*	70	...	...	...	— 70
18. Tantalite (exported), statute tons	11	2,749	24	7,106	+ 13	+ 4,357
19. Tin (exported), statute tons	85	15,002	77	13,432	— 8	— 1,570
Total values	...	2,128,179	...	2,087,893	...	— 40,286

* Contained in Gold ore.

TABLE 2.

Value and Percentage of Mineral Exports in relation to the Value of Total Exports from Western Australia.

Year.	Total Exports.	Mineral Exports (exclusive of Coal).	Percentage.
	£	£	
1901	8,515,623	6,920,118	81·27
1902	9,051,358	7,530,319	83·20
1903	10,324,732	8,727,060	84·53
1904	10,271,489	8,625,676	83·98
1905	9,871,019	7,731,954	78·33
1906	9,832,679	7,570,305	76·99
1907	9,904,860	7,544,992	76·17
1908	9,518,020	7,151,317	75·13
1909	8,860,494	5,906,673	66·66
1910	8,299,781	4,795,654	57·78
1911	10,606,863	7,171,638	67·61
1912	8,941,008	5,462,499	61·09
1913	9,128,607	4,608,188	50·48
1914	8,406,182	3,970,182	47·23
1915	6,291,934	2,969,502	47·19
1916	10,878,153	6,842,621	62·92
1917	9,323,229	5,022,694	53·87
1918	6,931,834	2,102,923	30·34
1919	14,279,240	6,236,585	43·67
1920	15,149,323	3,096,849	20·44
1921	10,331,405	1,373,810	13·30
1922	11,848,025	2,875,402	24·27
1923	11,999,500	3,259,476	27·16
1924	13,808,910	1,424,319	13·24
1925	13,642,852	173,126	1·27
1926	14,668,184	1,597,698	10 89
1927	15,805,120	472,041	2·99
1928	16,911,932	996,099	5·88
1929	16,660,742	1,802,709	10·82
Total since 1900 ...	320,063,098	133,962,429	41·85

TABLE 3.

Showing for every Goldfield the amount of Gold reported to the Mines Department as required by the Regulations; also the percentage for the several Goldfields of the total reported and the average value of the Gold per ton of ore treated.

Goldfield.	Reported Yield.					
	1928.	1929.	Percentage for each Goldfield		Average Value of Gold per ton of Ore treated.	
			1928.	1929.	1928.	1929.
	fine ozs.	fine ozs.			shillings.	shillings.
1. Kimberley	40	**184**	·01	**·05**	...	...
2. West Kimberley	...	...	...	...	...	...
3. Pilbara	1,946	**2,309**	·49	**·62**	192·75	**137·21**
4. West Pilbara	15	**60**	·01	**·02**	...	...
5. Ashburton	36	**9**	·01	**·01**	...	...
6. Gascoyne	60	**78**	·02	**·02**	...	**577·70**
7. Peak Hill	1,034	**1,085**	·26	**·29**	52·52	**36·17**
8. East Murchison...	4,758	**3,766**	1·21	**1·01**	181·16	**202·93**
9. Murchison	23,636	**23,427**	6·03	**6·30**	39·93	**43·34**
10. Yalgoo	6,206	**2,611**	1·58	**·70**	46·99	**51·79**
11. Mt. Margaret	35,224	**32,779**	8·98	**8·81**	26·60	**25·92**
12. North Coolgardie	5,774	**3,750**	1·47	**1·01**	51·96	**112·62**
13. Broad Arrow	1,190	**8,756**	·30	**2·35**	91·78	**47·04**
14. North-East Coolgardie	1,298	**709**	·33	**·19**	57·01	**68·60**
15. East Coolgardie	294,955	**282,550**	75·23	**75·94**	56·64	**52·48**
16. Coolgardie	6,104	**3,449**	1·56	**·93**	99·11	**66·51**
17. Yilgarn	5,338	**4,701**	1·36	**1·26**	122·23	**13·30**
18. Dundas	4,341	**1,651**	1·11	**·44**	56·51	**44·49**
19. Phillips River	113	**190**	·03	**·05**	118·52	**64·82**
State generally	10	...	·01	...	94·33	...
Totals and averages	392,079	**372,064**	100·00	**100·00**	51·18	**50·00**

The total gold yield of the State is as shown in Table 1, being the amount of gold exported, and also that lodged at the Royal Mint, which total includes alluvial gold and gold not reported to the Department

When comparisons are made as to the yield from any particular field with the preceding year, the figures reported to the Department are used.

TABLE 4.

Averages of Gold Ore raised and treated, and Gold produced therefrom, per man employed on the several Goldfields of the State, during **1928** *and* **1929.**

Goldfield.	1928.				1929.			
	Tons of Gold Ore raised and treated.		Fine ounces of Gold produced therefrom.		Tons of Gold Ore raised and treated.		Fine ounces of Gold produced therefrom.	
	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.
	tons.	tons.	fine ozs.	fine ozs.	tons.	tons.	fine ozs.	fine ozs.
1. Kimberley	...	...	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...	...	...
3. Pilbara	52·34	29·91	118·69	67·82	**58·47**	**25·51**	**94·44**	**41·21**
4. West Pilbara	...	...	...	...	...	...	...	...
5. Ashburton	...	...	...	...	...	...	...	...
6. Gascoyne	...	...	...	...	...	...	...	...
7. Peak Hill	156·90	71·32	96·93	44·06	**175·23**	**81·35**	**74·60**	**34·64**
8. East Murchison	20·70	8·39	42·79	17·90	**9·88**	**4·14**	**23·62**	**9·88**
9. Murchison	245·43	128·83	115·18	60·56	**237·87**	**124·13**	**121·35**	**63·33**
10. Yalgoo	200·07	112·04	110·64	61·96	**107·00**	**54·18**	**65·23**	**33·03**
11. Mt. Margaret	499·26	280·99	156·33	87·99	**489·18**	**269·98**	**149·24**	**82·36**
12. North Coolgardie	199·17	91·53	121·81	56·60	**92·81**	**40·45**	**127·60**	**53·63**
13. Broad Arrow	22·19	10·21	23·97	11·03	**212·57**	**98·21**	**117·71**	**54·38**
14. North-East Coolgardie ...	81·80	37·34	54·91	25·07	**26·86**	**12·35**	**21·71**	**9·99**
15. East Coolgardie	408·84	216·07	272·59	150·84	**382·31**	**215·02**	**246·44**	**138·61**
16. Coolgardie	60·33	27·45	70·38	32·03	**64·93**	**28·52**	**50·82**	**22·32**
17. Yilgarn	55·00	27·10	79·13	39·00	**52·38**	**19·64**	**82·24**	**30·84**
18. Dundas	171·84	89·45	114·00	59·34	**92·12**	**46·77**	**48·21**	**24·48**
19. Phillips River	11·57	3·37	16·19	4·72	**62·25**	**13·11**	**47·43**	**9·98**
Total Averages	324·69	171·39	195·61	103·26	**302·99**	**157·02**	**178·34**	**92·42**

The average value of gold produced per man above and under ground was £438·62 in 1928, and £392·58 in 1929. The average tonnage of ore raised shows a decrease from 171·39 tons to 157·02 tons. The average tonnage raised per man is highest in the Mount Margaret Goldfield, viz., 269·98 tons average value, £349·84, the next being East Coolgardie Goldfield with 215·02 tons, average value £588·78.

TABLE 5.

Output of Gold from the several States of Australia, the Northern Territory, Papua, and the Dominion of New Zealand during 1929.

State.	Output of Gold.	Value.	Percentage of total Output of Australasia.
	Fine ozs.	£	
1. Western Australia	377,176	1,602,142	69·71
2 Victoria	26,275	111,609	4·86
3. Queensland	9,476	40,250	1·75
4. New South Wales	7,496	31,842	1·38
5. Tasmania...	5,597	23,772	1·04
6. South Australia	1,009	4,289	·19
7. Papua	2,228	9,464	·41
8. Northern Territory	45	191	·01
9. New Zealand	111,727	474,585	20·65
Total	541,029	2,298,144	100·00

TABLE 6.

Dividends paid by Western Australian Gold Mining Companies during 1929 and Total to date.

(Compiled from information supplied by the Government Statistician's Office and the Chamber of Mines of W.A., Kalgoorlie.)

Goldfield.	Name of Company.	Capital.				Dividends.		
		Authorised	No. of Shares.	Par Value Shares.	Paid up to.	Paid in 1929.		Grand Total paid to end of 1929.
						No.	Total Amount.	
		£		£ s. d.	£ s. d.		£	£
Peak Hill ...	Various Companies ...	...	...	...	...	...	...	160,666
East Murchison...	Various Companies ...	...	...	...	...	...	...	437,968
Murchison ...	Various Companies ...	...	...	...	...	...	...	1,992,670
Mt. Margaret ...	Various Companies ...	...	...	...	...	...	...	1,504,701
North Coolgardie	Various Companies ...	...	...	...	...	...	...	575,032
North-East Coolgardie	Various Companies ...	...	...	...	...	...	...	89,854
East Coolgardie	Great Boulder Proprietary G.M's., Ltd.	175,000	1,750,000	0 2 0	0 2 0	1	21,875	6,064,092
Do. ...	Boulder Perseverance, Ltd. ...	125,000	2,495,866	0 1 0	0 1 0	1	12,482	1,540,897
Do. ...	South Kalgurli Consolidated, Ltd.	150,000	250,007	0 10 0	0 10 0	2	31,250	471,251
Do. ...	Other Companies	...	...	...	...	...	...	14,882,837
Coolgardie ...	Various Companies ...	...	...	...	...	...	...	339,495
Yilgarn	Various Companies ...	...	...	...	...	...	...	513,199
Dundas	Various Companies ...	...	...	...	...	...	...	222,625
	Total Dividends paid during 1929	...	...	...	...	...	65,607	...
	Total Dividends paid to end of 1929	...	...	...	...	...	...	28,795,287

TABLE 7.

Quantity and Value of Minerals, other than Gold and Coal, reported to the Mines Department during 1929.

Goldfield, District, or Mineral Field.	1929.		Increase or Decrease for Year compared with 1928.	
	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£
BLACK TIN.				
Pilbara Goldfield (Marble Bar District)	17·86	2,531	— 17·62	— 2,640
Greenbushes Mineral Field	38·30	4,079	— 16·24	— 2,276
Total	56·16	6,610	— 33·86	— 4,916
TANTALITE.				
Pilbara Goldfield (Marble Bar District)	11·27	3,598	+ 2·51	+ 1,385
Greenbushes Mineral Field	·30	70	+ ·30	+ 70
Total	11·57	3,668	+ 2·81	+ 1,455
COPPER ORE.				
Northampton Mineral Field	116·00	974	+ 116·00	+ 974
West Pilbara Goldfield	...	...	— 45·00	— 400
Phillips River Goldfield	33·18	420	+ 33·18	+ 420
Total	149·18	1,394	+ 104·18	+ 994
LEAD ORE.				
Northampton Mineral Field	1,075·00	3,767	+ 963·00	+ 3,452
ASBESTOS.				
Pilbara Goldfield (Marble Bar District)	63·70	6,113	+ 58·00	+ 5,513
Do. do. (Nullagine District)	...	...	— 6·00	— 182
West Pilbara Goldfield	191·25	8,568	+ 191·25	+ 8,568
Total	254·95	14,681	+ 243·25	+ 13,899
GYPSUM.				
Yilgarn Goldfield	761·00	761	— 453·00	— 453
State generally	4,528·00	6,915	+ 1,528·00	+ 2,704
Total	5,289·00	7,676	+ 1,075·00	+ 1,251
EMERALDS.	Carats (rough and cut.)			
Murchison Goldfield (Cue District)	609·00	278	*	— 632

* The production in 1928 was 17,564 carats (rough) of low value.

The output of black tin shows a decrease in tonnage of 33.86 tons and in value of £4,916. Tantalite shows an increase in tonnage of 2.81 tons, and in value of £1,455. Copper ore also shows increases in tonnage of 104.18 tons and in value of £994, while Lead Ore recorded increases of 963.00 tons and £3,452. The production of Asbestos was 254.95 tons, being a substantial increase in tonnage of 243.25 tons and in value of £13,899. Gypsum recorded increases in tonnage of 1,075.00 tons and in value £1,251. The value of Emeralds decreased by £632.

The production of tin was again confined to Pilbara and Greenbushes Fields, and Tantalite principally came from Pilbara, although a small parcel was obtained from Greenbushes. Copper ore came from Northampton Mineral Field and Phillips River Goldfield, while Lead Ore came from Northampton. Asbestos was obtained from Pilbara and West Pilbara Goldfields, and Gypsum from Yilgarn Goldfield and the State generally. Emeralds were produced from Murchison Goldfield.

TABLE 8.

Quantity of Coal raised during 1928 and 1929, and estimated Value thereof, with Number of Men employed, and Output per Man.

Coalfield.	Year	Quantity raised.	Estimated Value.	Men employed.		Quantity raised.	
				Above ground.	Under-ground.	Per Man employed under-ground.	Per Man employed above and under ground.
		tons.	£			tons.	tons.
Collie	1928	528,420	420,145	198	600	881	662
	1929	544,719	426,706	209	649	839	635

The number of men employed at collieries has increased by 60, and the output has increased by 16,299 tons, and the value by £6,561.

PART III.—LEASES AND OTHER HOLDINGS UNDER THE VARIOUS ACTS RELATING TO MINING.

TABLE 9.

Total Number and Acreage of Leases held for Mining on 31st December, 1928 and 1929.

Description of Leases.	1928.		1929.	
	No.	Acreage.	No.	Acreage.
Gold mining leases on Crown land	380	6,072	391	6,179
„ „ „ private property	1	6	1	6
Mineral leases on Crown land	253	46,938	263	47,269
„ „ „ private property	6	202	6	202
	640	53,218	661	53,656

The total number of leases held for mining purposes increased by 21 and the area by 438 acres, as compared with the year 1928. The number of leases for gold mining increased by 11 and the area by 107 acres. The number of mineral leases increased by 10 and the area by 331 acres.

TABLE 10.

Number and Acreage of Gold Mining Leases in force each year for the Five Years ending the 31st December, 1929.

Goldfield.		District.		1925.		1926.		1927.		1928.		1929.		Percentage of Total Acreage.		Increase or Decrease in Acreage for 1929 compared with 1928.		Goldfield.
Name.	Proclaimed.	Name.	Proclaimed.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	1928.	1929.	Increase	Decrease	
West Kimberley ...	19-3-20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	West Kimberley.
Kimberley ...	20-5-86	...	...	...	...	...	...	2	48	...	...	...	...	...	...	...	...	Kimberley.
Yilgarn	1-10-88	...	...	34	544	33	619	39	739	31	541	24	382	9·00	6·27	...	159	Yilgarn.
		(Private Property)	...	1	24	...	...	1	6	1	6	1	6					
Pilbara	1-10-88	Marble Bar ...	6-11-96	10	85	11	91	10	98	11	88	13	100	2·53	2·30	...	12	Pilbara.
		Nullagine ...	6-11-96	3	30	2	12	5	90	4	66	3	42					
Ashburton ...	11-12-90	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Ashburton.
Murchison	24-9-91	Cue	7-12-94	14	198	10	137	15	234	12	192	17	330	11·85	14·39	170	...	Murchison.
		Meekatharra ...	7-12-94	22	356	20	310	20	293	22	323	29	405					
		Day Dawn ...	10-1-96	7	73	6	64	6	64	6	64	7	76					
		Mount Magnet ...	7-12-94	10	91	16	151	12	123	14	141	8	79					
Dundas	31-8-93	...	...	8	108	8	90	8	104	11	158	14	206	2·59	3·33	48	...	Dundas.
Coolgardie ...	6-4-94	Coolgardie ...	7-12-94	30	474	14	250	16	283	18	304	20	2c5	5·47	5·22	...	9	Coolgardie.
		Kunanalling ...	18-8-97	10	133	10	133	4	45	2	28	2	28					
East Coolgardie ...	1-10-94	East Coolgardie	7-12-94	112	1,673	87	1,302	86	1,276	83	1,240	80	1,185	21·34	19·36	...	100	East Coolgardie.
		Bulong	19-2-96	3	69	3	57	3	57	3	57	1	12					
Yalgoo	23-1-95	...	...	16	239	14	166	11	146	10	142	23	331	2·33	5·35	189	...	Yalgoo.
North Coolgardie	28-6-95	Menzies	19-2-96	19	295	16	270	9	94	9	83	9	70	4·28	2·44	...	109	North Coolgardie.
		Ularring	19-2-96	...	...	2	48	3	60	3	60	1	12					
		Yerilla	19-2-96	3	51	4	42	2	27	2	27	2	27					
		Niagara	10-3-97	2	17	2	17	...	...	8	90	4	42					
East Murchison ...	28-6-95	Lawlers	1-6-04	12	178	8	155	4	73	3	13	1	6	21·06	20·00	...	43	East Murchison.
		Black Range ...	1-6-04	5	86	6	89	4	62	3	56	3	56					
		Wiluna	23-2-10	51	1,067	48	986	54	1,109	59	1,211	57	1,175					
North-East Coolgardie	19-2-96	Kanowna ...	19-2-96	13	165	12	162	9	116	4	32	1	2	·53	·03	...	30	N.E. Coolgardie.
		Kurnalpi ...	19-2-96	1	24	3	72	...	...	...	...	...	...					
Broad Arrow ...	11-11-96	...	...	16	274	13	218	11	185	12	189	14	219	3·11	3·54	30	...	Broad Arrow.
Peak Hill ...	19-3-97	...	...	8	42	9	55	8	49	6	39	8	75	·64	1·21	36	...	Peak Hill.
Mount Margaret	10-3-97	Mount Margaret	10-3-97	9	182	7	134	7	134	7	150	11	246	14·19	15·30	84	...	Mount Margaret.
		Mount Malcolm...	10-3-97	25	547	24	529	24	529	28	625	29	637					
		Mount Morgans...	23-3-02	6	102	7	111	7	116	5	87	4	63					
West Pilbara ...	1-11-95	...	...	1	6	2	30	2	30	2	30	...	...	·49	...	...	30	West Pilbara.
Phillips River ...	14-9-00	...	...	7	94	6	88	4	63	2	36	2	36	·59	·58	...	...	Phillips River.
Other Localities ...	...	...	...	9	156	11	192	...	...	...	...	2	30	...	·48	30	...	Other Localities.
Gascoyne	17-3-97	...	...	2	12	...	...	...	...	...	...	2	12	...	·20	12	...	Gascoyne.
Totals ...	... ...	... ...	...	469	7,395	414	6,580	386	6,253	381	6,078	392	6,185	100·00	100·00	599	492	

Increase for the Year 1929—Leases, 11 ; Acres, 107. The largest percentage of the area leased for Gold Mining purposes is in the respective order:— East Murchison, 20·00 ; East Coolgardie, 19·36 ; Mt. Margaret, 15·30 ; Murchison, 14·39 ; Yilgarn, 6·27 ; Yalgoo, 5·35 ; Coolgardie, 5·22.

TABLE 11.

Number and Acreage of Mineral Leases in force 31st December each year, for the Five Years ending 31st December, 1929.

Mining District.		Sub-District.		1925		1926.		1927.		1928.		1929.		Increase or Decrease in Acreage for 1929, compared with 1928.		Mining District.
Name.	Proclaimed.	Name.	Proclaimed.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Increase.	Decrease.	
Ashburton	11-12-90	...	...	1	15	3	75	1	15	...	...	...	...	...	...	Ashburton.
Murchison	24-9-91	Cue	7-12-94	...	...	2	42	14	296	21	452	15	296	...	156	Murchison.
		Meekatharra ...	7-12-94	...	...	...	...	...	...	...	...	...	...			
		Day Dawn ...	10-1-96	...	...	...	...	...	...	...	...	...	...			
		Mt. Magnet ...	7-12-94	...	...	...	...	...	...	...	...	...	...			
Greenbushes ...	7-4-92	...	...	5	97	7	152	8	176	10	209	10	187	...	22	Greenbushes.
Pilbara	16-6-92	Marble Bar ...	16-6-92	16	509	27	752	26	561	31	859	40	998	379	...	Pilbara.
		Nullagine ...	6-11-96	3	21	...	...	1	40	...	...	5	240			
Yalgoo	23-1-95	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Yalgoo.
Yilgarn	22-3-95	...	...	...	...	...	...	1	48	...	...	1	24	24	...	Yilgarn.
Coolgardie	22-3-95	Coolgardie ...	22-3-95	2	28	2	28	2	28	1	6	1	6	...	...	Coolgardie.
		Kunanalling ...	1-9-97	...	...	...	...	...	...	...	...	...	...			
East Coolgardie ...	22-3-95	East Coolgardie	22-3-95	1	1	2	13	1	1	1	1	1	1	...	...	East Coolgardie.
		Bulong	19-2-96	...	...	...	...	...	...	...	...	...	...			
East Murchison ...	28-6-95	Lawlers	1-6-04	...	...	...	...	...	...	...	...	...	...	...	...	East Murchison.
		Black Range ...	1-6-04	...	...	...	...	...	...	...	...	...	...			
		Wiluna	23-2-10	...	...	...	...	...	...	...	...	...	...			
North Coolgardie ...	16-8-95	Menzies	19-2-96	...	...	...	...	...	...	...	...	...	...	...	...	North Coolgardie.
		Ularring	19-2-96	...	...	...	...	...	...	...	...	...	...			
		Yerilla	19-2-96	...	...	...	...	...	...	...	...	...	...			
		Niagara	10-3-97	...	...	...	...	...	...	...	...	...	...			
West Pilbara ...	1-11-95	...	...	14	588	11	476	14	614	15	646	...	...	...	646	West Pilbara.
Dundas	27-12-95	...	...	2	36	2	36	2	36	2	36	...	...	...	36	Dundas.
Collie	21-2-96	...	...	117	35,619	117	35,619	126	38,379	126	38,379	126	38,379	...	...	Collie.
North-East Coolgardie	19-2-96	Kanowna ...	19-2-96	2	106	2	106	1	10	1	10	1	10	...	...	North-East Coolgardie.
		Kurnalpi ...	19-2-96	...	...	...	...	...	...	...	...	...	...			
Broad Arrow ...	11-11-96	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Broad Arrow.
Northampton ...	16-12-96	...	...	19	387	19	371	14	292	8	148	5	80	...	68	Northampton.
		(Private Property)	...	8	251	9	275	6	203	5	200	5	200			
Peak Hill	19-3-97	...	...	...	...	...	...	...	...	...	...	...	...			Peak Hill.
Mt. Margaret ...	10-3-97	Mt. Margaret ...	10-3-97	...	...	...	...	...	...	...	...	...	...	...	...	Mt. Margaret.
		Mt. Malcolm ...	10-3-97	...	...	...	...	...	...	...	...	...	...			
		Mt. Morgans ...	23-3-02	...	...	...	...	...	...	...	...	...	...			
Gascoyne	17-3-97	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Gascoyne.
Phillips River ...	14-7-99	...	...	19	373	18	323	17	275	3	83	3	83	...	...	Phillips River.
Other localities ...	...	...	...	25	6,860	25	6,890	24	5,661	24	5,661	41	6,349	688	...	Other Localities.
		(Private Property)	...	2	68	2	50	2	50	1	2	1	2	...	...	
West Kimberley ...	19-3-20	...	...	10	448	10	448	10	448	10	448	10	448	...	...	West Kimberley.
Kimberley	20-5-86	...	...	...	...	...	...	...	...	...	...	4	168	168	...	Kimberley.
Totals ...	...	...	...	246	45,407	258	45,656	270	47,133	259	47,140	269	47,471	1,259	928	

In the Collie Mineral Field the largest area is held, viz.:—38,379 acres, worked entirely for Coal; then follow Pilbara, 1,238 acres for Tin, Silver, and Lead, Asbestos, Vanadium, Tantalite, and Lead; West Kimberley, 448 acres for Iron; Murchison, 296 acres for Emeralds; Northampton, 280 acres for Lead; Greenbushes, 187 acres for Tin; Kimberley, 168 acres for Tin.

TABLE 12.

Number and Acreage of Mineral Leases in force on 31st December, 1929, showing Minerals for which they are worked.

Goldfield or Mineral Field.	District.	Mineral. Coal. Leases.	Coal. Acres.	Tin. Leases.	Tin. Acres.	Copper. Leases.	Copper. Acres.	Iron. Leases.	Iron. Acres.	Emerald. Leases.	Emerald. Acres.	Ochre. Leases.	Ochre. Acres.	Silver and Lead. Leases.	Silver and Lead. Acres.	Asbestos. Leases.	Asbestos. Acres.	Vanadium. Leases.	Vanadium. Acres.	Clay. Leases.	Clay. Acres.	Mineral Oil. Leases.	Mineral Oil. Acres.
Yilgarn	... ...	...	...	1	24	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pilbara	Marble Bar ...	...	...	11	214	...	...	...	...	...	...	...	...	4	122	6	288	1	48	...	...	...	...
	Nullagine ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	240	...	...	...	...	...	...
Murchison	Cue	...	...	...	...	...	...	...	...	15	296	...	...	...	...	...	...	...	...	...	...	...	...
Kimberley	... ...	...	...	4	168	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
East Coolgardie ...	... ...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...
Coolgardie	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
North-East Coolgardie	Kanowna ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Phillips River ...	... ...	...	...	...	...	3	83	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Collie	... ...	126	38,379	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenbushes ...	... ...	...	...	10	187	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Northampton ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	(Private Property)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Outside Proclaimed Fields	... ...	18	5,440	...	...	8	352	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	111
	(Private Property)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	...	...
West Kimberley ...	... ...	...	...	...	...	...	...	10	448	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Totals	144	43,819	26	593	11	435	10	448	15	296	1	1	4	122	19	846	1	48	1	2	4	111

Goldfield or Mineral Field.	District.	Mineral. Alunite. Leases.	Alunite. Acres.	Tantalite. Leases.	Tantalite. Acres.	Lead. Leases.	Lead. Acres.	Gypsum. Leases.	Gypsum. Acres.	Felspar. Leases.	Felspar. Acres.	Potash. Leases.	Potash. Acres.	Manganese. Leases.	Manganese. Acres.	Total. Leases.	Total. Acres.
Yilgarn	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	24
Pilbara	Marble Bar ...	...	...	15	206	3	120	...	...	...	...	...	...	...	...	40	998
	Nullagine ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	240
Murchison	Cue	...	...	...	...	...	...	...	...	...	...	...	...	...	...	15	296
Kimberley	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	168
East Coolgardie ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1
Coolgardie	... ...	...	...	...	...	...	...	...	...	1	6	...	...	...	...	1	6
North-East Coolgardie ...	Kanowna ...	...	...	...	...	...	...	...	...	...	...	1	10	...	...	1	10
Phillips River	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	83
Collie	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	126	38,379
Greenbushes	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	187
Northampton	... ...	...	...	...	...	5	80	...	...	...	...	...	...	...	...	5	80
	(Private Property) ...	...	...	...	...	5	200	...	...	...	...	...	...	...	...	5	200
Outside Proclaimed Fields	... ...	1	40	...	...	...	...	1	40	...	...	...	...	1	48	41	6,349
	(Private Property) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2
West Kimberley ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	448
	Totals	1	40	15	206	13	400	1	40	1	6	1	10	1	48	269	47,471

TABLE 13.

Number and Acreage of Miscellaneous Leases in force on 31st December, 1929.

Goldfield.	District.	Leases.								Total.	
		Tailings.		Tramway.		Water.		Machinery.			
		No.	Acres.	No.	Acres.	No.	Acres.	No.	Acres.	No.	Acres.
Outside Proclaimed Fields	... ...	...	...	2	25	...	...	...	...	2	25
North Coolgardie	Menzies	1	12	...	...	1	5	...	...	2	17
East Coolgardie	... ...	12	245	...	...	...	...	1	1	13	246
Coolgardie	... ...	1	7	...	...	1	13	...	...	2	20
Phillips River	... ...	...	...	...	...	...	...	1	10	1	10
	Total	14	264	2	25	2	18	2	11	20	318

Table 14.

Claims and Authorised Holdings, under "The Mining Act, 1904," and Regulations, existing on 31st December, 1928 and 1929.

Goldfield or Mineral Field.	District.	Prospecting Areas.				Water Rights.				Lode Claims.		Alluvial Claims.		Mineral Claims.		Dredging Claims.		Residence Areas.		Business Areas.		Machinery Areas.		Tailings Areas.		Garden Areas.		Washing Areas.		Quarrying Areas.	
		Number.		Acreage.		Number.		Acreage.																							
		1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.	1928.	1929.
Kimberley		1	1	24	12	...	...	...	...	...	1	...	...	...	...	...	2	...	1	...	...	...	...	...	...	...	3	...	...	...	...
West Kimberley		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Northampton		1	4	24	96	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pilbara	Marble Bar	8	18	95	322	3	2	27	3	...	1	2	1	72	84	...	...	...	...	5	5	1	1	...	...	4	4	...	...	...	...
Do.	Nullagine	5	5	108	102	2	3	2	3	...	...	...	...	8	8	...	...	5	2	...	...	...	1	...	...	2	2	...	...	...	...
West Pilbara		1	...	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	...	...	...	...	2	...	...	...	...	...
Ashburton		1	1	6	24	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	...	...	...	...	...	...	...	...	...	...
Peak Hill		8	16	129	270	1	1	10	10	...	...	...	...	8	8	...	...	1	...	...	...	...	...	2	2	1	1	...	...	...	...
East Murchison	Lawlers	3	1	46	10	3	3	6	6	...	...	...	...	...	...	...	...	...	...	...	...	2	2	8	8	2	2	...	...	...	...
Do.	Wiluna	21	19	437	396	7	12	11	25	...	...	...	...	...	...	...	...	14	24	...	1	...	1	1	1	3	...	...	...	...	1
Do.	Black Range	22	20	379	302	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	1	...	...	...	...	...
Murchison	Cue	21	19	322	200	5	5	22	22	...	...	...	...	9	12	...	...	1	1	...	...	...	...	...	...	1	1	...	...	...	...
Do.	Meekatharra	18	21	232	311	1	1	10	10	...	...	...	...	...	...	...	...	4	4	2	2	1	1	1	1	1	1	...	...	...	...
Do.	Day Dawn	5	7	57	86	3	3	4	4	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	1	...	...	...	...
Do.	Mt. Magnet	41	23	536	281	1	...	1	...	...	...	...	...	...	...	...	...	...	...	1	1	1	2	...	...	5	5	...	...	...	...
Yalgoo		35	36	701	694	...	...	...	...	...	...	...	...	...	...	...	...	3	3	5	4	1	1	1	1	1	1	...	...	...	...
Mt. Margaret	Mt. Morgans	6	6	126	82	4	7	9	12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Do.	Mt. Malcolm	5	8	84	92	18	20	172	174	...	...	...	...	...	...	...	...	...	3	3	3	...	...	1	1	10	9	...	...	...	...
Do.	Mt. Margaret	23	7	509	124	10	13	11	28	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	...	4	4	...	...	...	...
North Coolgardie	Menzies	8	12	120	121	4	3	12	9	...	...	...	...	...	...	...	...	...	...	2	1	1	1	...	...	4	4	...	...	...	...
Do.	Ularring	2	3	30	34	5	3	5	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Do.	Niagara	13	7	286	66	2	2	2	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Do.	Yerilla	2	2	48	36	6	4	10	6	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	1	...	...	...	...
Broad Arrow		20	36	311	623	5	6	22	23	...	...	...	...	1	...	...	...	...	...	3	2	...	...	1	1	...	...	...	...	...	...
N.E. Coolgardie	Kanowna	9	25	175	552	...	...	...	...	...	...	...	...	1	2	...	...	...	...	...	...	1	...	...	...	3	3	...	...	...	...
Do.	Kurnalpi	3	9	60	126	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...	...	...
East Coolgardie		61	59	896	1,001	5	4	18	17	...	...	1	...	...	...	...	...	...	...	...	...	4	4	12	12	16	15	...	...	...	...
Do.	Bulong	6	6	108	126	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coolgardie		28	36	456	691	9	8	39	38	...	...	1	1	1	...	...	...	2	2	3	2	1	1	2	2	...	...	...	...	...	...
Do.	Kunanalling	9	8	174	117	6	5	40	35	...	...	...	...	...	...	...	...	1	1	2	2	...	...	...	...	...	...	...	...	...	...
Yilgarn		53	68	1,094	1,359	...	...	...	...	1	1	...	...	...	1	...	...	15	7	13	13	...	1	...	...	1	1	...	...	...	...
Dundas		9	7	168	114	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...	...	...
Phillips River		5	7	110	108	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	1	3	2	...	...	...	...
Collie		5	...	6,904	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenbushes		1	1	24	24	6	6	13	13	...	...	11	12	...	...	18	19	...	18	...	...	2	2	...	...	14	14	...	...	...	...
Gascoyne		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...
Outside Proclaimed Fields		26	19	11,114	28,663	...	1	...	5	...	...	...	...	8	30	...	...	...	3	...	10	...	...	...	...	...	2	...	...	...	...
	Totals	485	517	25,025	37,165	106	112	446	448	1	3	16	15	108	146	18	21	48	71	51	48	23	24	30	30	83	76	...	...	...	1
Increase or Decrease for 1929 compared with 1928		+ 32		+ 12,140		+ 6		+ 2		+ 2		— 1		+ 38		+ 3		+ 23		— 3		+ 1		...		— 7		...		+ 1	

For the Year 1928 the number of prospecting areas held was 485, the total acreage being 25,025, which included 8 areas of 17,160 acres for coal. For the Year 1929 the number held was 517 of a total acreage of 37,165, including 11 areas of 28,420 acres for coal.

TABLE 15.

Number and Acreage of Miners' Homestead Leases in force on 31st December, 1928 and 1929.

Goldfield.	District.	1928.		1929.		Increase.		Decrease.	
		Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.
West Pilbara	... ...	...	...	...	...	...	...	...	...
Greenbushes	... ...	6	522	6	522	...	...	...	...
Pilbara	Marble Bar ...	...	...	...	...	...	...	...	...
	Nullagine	...	...	...	...	...	...	...	...
Dundas	... ...	19	1,099	17	1,074	...	...	2	25
Broad Arrow	... ...	1	4	1	4	...	...	...	...
Yilgarn	... ...	14	411	14	411	...	...	...	...
Mt. Margaret ...	Mt. Malcolm ...	8	1,265	9	1,275	1	10	...	...
	Mt. Margaret ...	12	325	12	325				
Murchison ...	Cue	4	1,204	4	1,204	1	10	...	...
	Day Dawn ...	2	25	2	25				
	Meekatharra ...	10	1,665	10	1,665				
	Mt. Magnet ...	1	236	2	246				
Yalgoo	... ...	4	710	4	710	...	...	...	...
Coolgardie ...	Coolgardie	21	891	21	891	...	...	...	...
	Kunanalling ...	3	530	3	530				
East Coolgardie ...	... ...	71	2,055	72	2,092	1	37	...	...
Phillips River	... ...	124	17,401	121	16,842	...	...	3	559
Peak Hill	... ...	5	547	5	547	...	...	...	...
North-East Coolgardie ...	Kanowna	12	702	12	702	...	...	...	...
North Coolgardie	Menzies	5	690	5	690	...	...	...	...
	Yerilla	1	10	1	10				
	Niagara	1	20	1	20				
	Ularring	1	20	1	20				
East Murchison...	Lawlers	6	1,115	6	1,115	5	1,046	...	...
	Black Range ...	...	...	...	...				
	Wiluna	7	108	12	1,154				
	Total ...	338	31,555	341	32,074	8	1,103	5	584

As compared with the Year 1928, the number of leases held has increased by 3 and the area by 519 acres.

PART IV.—MEN EMPLOYED.

TABLE 16.

Average number of Men engaged in Mining during 1928 and 1929.

Goldfield.	District.	Reef or Lode.		Alluvial.		Total.	
		1928.	1929.	1928.	1929.	1928.	1929.
1. Kimberley	... ...	...	...	4	4	4	4
2. West Kimberley	... ...	...	...	...	...	...	...
3. Pilbara	Marble Bar	22	35	7	6	29	41
	Nullagine	6	20	1	3	7	23
4. West Pilbara	... ...	...	...	2	2	2	2
5. Ashburton	... ...	...	...	2	2	2	2
6. Gascoyne	... ...	2	...	2	2	4	2
7. Peak Hill	... ...	22	28	5	3	27	31
8. East Murchison	Lawlers	19	15	6	6	25	21
	Wiluna	165	305	...	...	165	305
	Black Range	55	60	1	...	56	60
	Cue	86	83	...	...	86	83
9. Murchison	Meekatharra	187	177	9	10	196	187
	Day Dawn	27	23	...	...	27	23
	Mt. Magnet	88	83	2	2	90	85
10. Yalgoo	... ...	100	79	...	...	100	79
11. Mt. Margaret	Mt. Morgans	27	31	...	...	27	31
	Mt. Malcolm	336	333	...	2	336	335
	Mt. Margaret	35	31	...	...	35	31
	Menzies	64	34	...	1	64	35
12. North Coolgardie	Ularring	16	17	...	1	16	18
	Niagara	15	6	...	...	15	6
	Yerilla	4	12	...	...	4	12
13. Broad Arrow	... ...	100	158	9	10	109	168
14. North-East Coolgardie ...	Kanowna	30	34	2	3	32	37
	Kurnalpi	16	16	1	1	17	17
15. East Coolgardie	East Coolgardie	1,920	2,012	29	36	1,949	2,048
	Bulong	31	22	1	2	32	24
16. Coolgardie	Coolgardie	125	121	12	10	137	131
	Kunanalling	31	27	...	...	31	27
17. Yilgarn	... ...	136	152	1	...	137	152
18. Dundas	... ...	73	65	...	...	73	65
19. Phillips River	... ...	24	19	1	...	25	19
State generally	... ...	4	4	...	...	4	4
Total—Gold Mining		3,766	4,002	97	106	3,863	4,108
MINERALS OTHER THAN GOLD.							
Tantalite	Marble Bar	13	16	...	...	13	16
Tin	Greenbushes	39	32	...	...	39	32
	Cue	10	...	...	...	10	...
Copper	Marble Bar	40	5	*30	12	70	17
	West Pilbara	2	...	...	...	2	...
	Phillips River	8	7	...	...	8	7
Do.	Northampton	...	2	...	...	...	2
Lead Ore	Northampton	2	28	...	...	2	28
Coal	Collie River	798	858	...	...	798	858
Asbestos	Marble Bar	6	20	...	...	6	20
	Nullagine	4	4	...	...	4	4
Do.	West Pilbara	...	23	...	...	...	23
Gypsum	Yilgarn	10	10	...	...	10	10
	State Generally	15	17	...	...	15	17
Silver-Lead Ore	Marble Bar	3	3	...	...	3	3
Emeralds	Cue	10	14	...	...	10	14
	Total—Other Minerals ...	960	1,039	30	12	990	1,051
	GRAND TOTAL	4,726	5,041	127	118	4,853	5,159

*Classified elsewhere as employed at mines.

TABLE 17.

Average Number of Men employed at Mines during 1929.

Mineral.	Above ground.	Under ground.	Total.	Percentage of total men employed.	Increase or decrease compared with 1928.
Asbestos	22	25	47	·93	+ 37
Coal	209	649	858	16·98	+ 60
Copper	7	2	9	·18	— 1
Gold	1,928	2,074	4,002	79·20	+ 236
Gypsum	27	...	27	·53	+ 2
Lead	13	15	28	·55	+ 26
Silver-Lead Ore	2	1	3	·06	...
Tantalite	13	3	16	·32	+ 3
Tin	*47	2	49	·97	— 70
Emeralds	7	7	14	·28	+ 4
Total	2,275	2,778	5,053	100·00	+ 297

* As the tin obtained is principally "stream tin," the average number of alluvial workers has been, in this case, included in the heading "above ground."

The above table deals with men working their own mines, or employed on wages, and is compiled from returns furnished to the Department by mine-owners.

TABLE 18.

Average Number of Men employed at Gold Mines during 1929, classified according to the several Goldfields and the proportion of Men employed in each Goldfield.

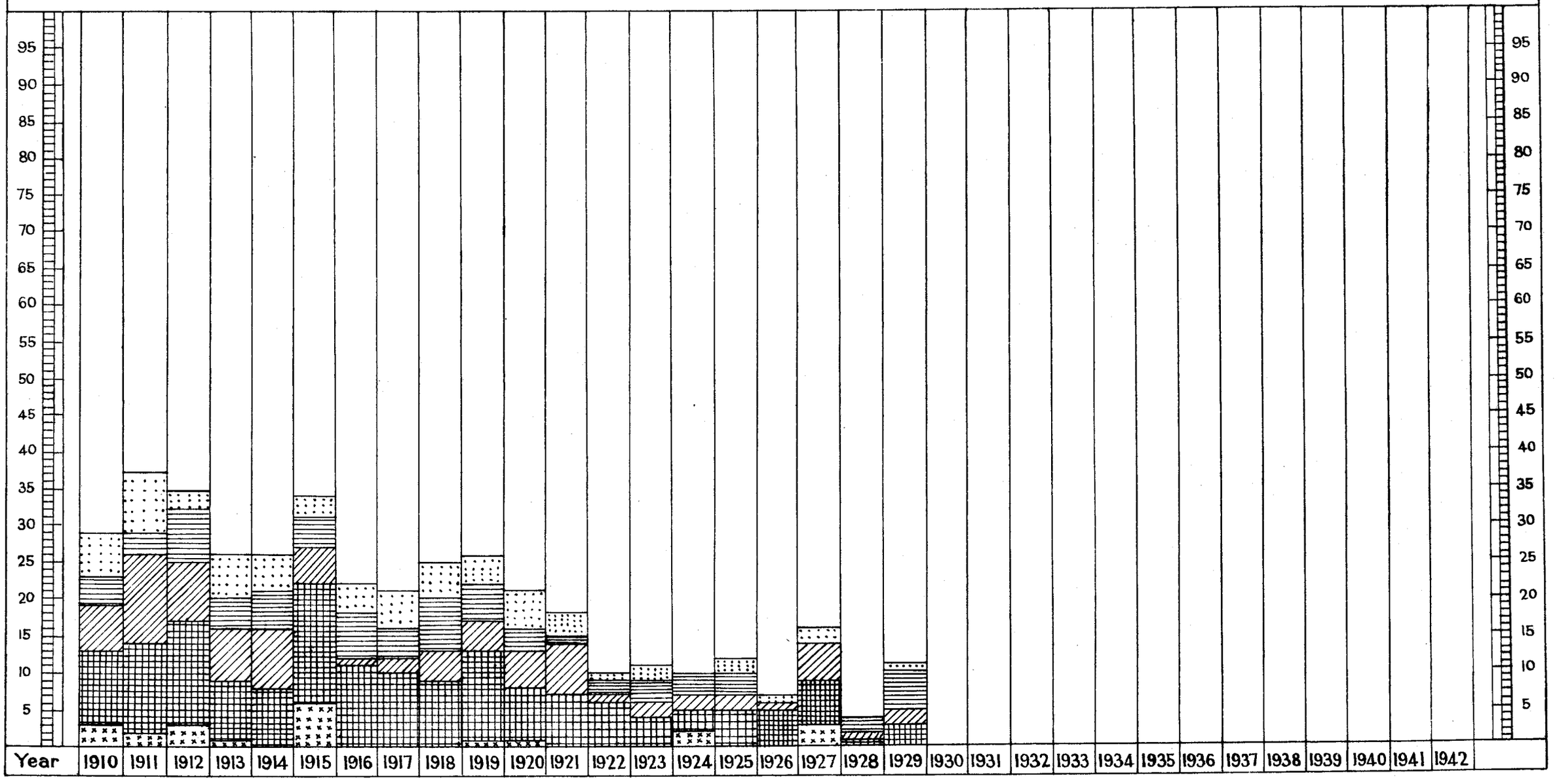
Goldfield.	Above ground.	Under ground.	Total.	Increase or Decrease compared with 1928.	Percentage of total Men employed.	
					1928.	1929.
1. Kimberley	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...
3. Pilbara	31	24	55	+ 27	·75	1·37
4. West Pilbara	...	...	...	...	...	...
5. Ashburton	...	...	...	...	...	...
6. Gascoyne	...	...	...	— 2	·05	...
7. Peak Hill	15	13	28	+ 6	·58	·70
8. East Murchison	221	159	380	+ 141	6·32	9·50
9. Murchison	175	191	366	— 22	10·30	9·15
10. Yalgoo	39	40	79	— 21	2·66	1·97
11. Mt. Margaret	177	218	395	— 3	10·57	9·87
12. North Coolgardie	40	29	69	— 30	2·63	1·72
13. Broad Arrow	85	73	158	+ 58	2·66	3·95
14. North-East Coolgardie	27	23	50	+ 4	1·22	1·25
15. East Coolgardie	890	1,144	2,034	+ 83	51·81	50·83
16. Coolgardie	83	65	148	— 8	4·15	3·70
17. Yilgarn	95	57	152	+ 16	3·61	3·80
18. Dundas	32	33	65	— 8	1·94	1·62
19. Phillips River	15	4	19	— 5	·64	·47
State generally	3	1	4	...	·11	·10
Total	1,928	2,074	4,002	+ 236	100·00	100·00

TABLE 19.

Alluvial Gold Workers.

Goldfield.	1928.	1929.	Increase or Decrease compared with 1928.
1. Kimberley	4	4	...
2. West Kimberley	...	...	...
3. Pilbara	8	9	+ 1
4. West Pilbara	2	2	...
5. Ashburton	2	2	...
6. Gascoyne	2	2	...
7. Peak Hill	5	3	— 2
8. East Murchison	7	6	— 1
9. Murchison	11	12	+ 1
10. Yalgoo	...	...	...
11. Mt. Margaret	...	2	+ 2
12. North Coolgardie	...	2	+ 2
13. Broad Arrow	9	10	+ 1
14. North-East Coolgardie	3	4	+ 1
15. East Coolgardie	30	38	+ 8
16. Coolgardie	12	10	— 2
17. Yilgarn	1	...	— 1
18. Dundas	...	...	...
19. Phillips River	1	...	— 1
Total	97	106	+ 9

DIAGRAM SHEWING THE NUMBER OF DEATHS FROM ACCIDENTS ARRANGED IN FIVE CLASSES, IN THE MINES OF WESTERN AUSTRALIA DURING THE YEARS 1910 AND ONWARDS.



PART V.—ACCIDENTS.

TABLE No. 20.

MEN EMPLOYED IN MINES KILLED AND INJURED IN MINING ACCIDENTS DURING 1928 AND 1929.

A.—*According to Locality of Accident.*

Goldfield.	Killed.		Injured.		Total Killed and Injured.	
	1928.	1929.	1928.	1929.	1928.	1929.
1. Kimberley	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...
3. Pilbara	1	...	1	...	2	...
4. West Pilbara	...	...	...	...	...	...
5. Ashburton	...	...	...	...	...	...
6. Gascoyne	...	...	...	...	...	...
7. Peak Hill	...	...	...	...	...	...
8. East Murchison	...	1	5	24	5	25
9. Murchison	...	2	9	22	9	24
10. Yalgoo	...	...	1	2	1	2
11. Mt. Margaret	...	1	40	26	40	27
12. North Coolgardie	...	...	3	2	3	2
13. N.E. Coolgardie	...	...	...	...	...	...
14. Broad Arrow	...	...	...	...	...	...
15. East Coolgardie	2	3	156	136	158	139
16. Coolgardie	...	...	...	...	...	...
17. Yilgarn	...	...	...	2	...	2
18. Dundas	...	...	...	...	...	...
19. Phillips River	...	...	...	...	...	...
MINING DISTRICTS—						
Northampton	...	...	...	1	...	1
Greenbushes	...	...	1	...	1	...
Collie	1	4	115	111	116	115
Swan	...	...	4	32	4	32
Kendenup	...	...	...	...	...	...
Roelands	...	...	...	...	...	...
Total	4	11	335	358	339	369

From the above table it will be seen that the total number of fatal accidents for the year 1929 was 11 as against 4 for 1928. The number injured shows an increase of 23 as compared with the preceding year. In the report of the State Mining Engineer, published as Division II. of this Report, these accidents are classified according to the causes.

B.—*According to Causes of Accidents.*

	1928.		1929.		Comparison with 1928.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. Explosives	...	7	...	11	...	+ 4
2. Falls of Ground	1	19	3	23	+ 2	+ 4
3. In Shafts	1	6	2	14	+ 1	+ 8
4. Miscellaneous Underground	2	212	5	195	+ 3	— 17
5. Surface	...	91	1	115	+ 1	+ 24
Total	4	335	11	358	+ 7	+ 23

Seven fatal accidents occurred in gold mines and four in coal mines. The death rate per 1,000 men employed in gold mines was 1.75 as against .53 in 1928.

TABLE No. 21.

Deaths from Accidents of Persons Employed at Mines during 1928 *and* 1929.

	1928.						1929.					
	Number of Persons killed.			Death Rate per 1,000 men employed.			Number of Persons killed.			Death Rate per 1,000 men employed.		
	Above Ground.	Under Ground.	Total.	Above Ground.	Under Ground.	Total.	Above Ground.	Under Ground.	Total.	Above Ground.	Under Ground.	Total.
Coal Mines	...	1	1	...	1·66	1·25	...	4	4	...	6·16	4·66
Men employed	(198)	(600)	(798)	...	...	...	(209)	(649)	(858)	...	...	...
Gold Mines	...	2	2	...	1·01	·52	1	6	7	·49	2·89	1·70
Men employed	(1,875)	(1,988)	(3,863)	...	...	...	(2,034)	(2,074)	(4,108)	...	...	...
Other Mines	...	1	1	...	35·71	5·21	...	...	...	...	...	...
Men employed	(164)	(28)	(192)	...	...	...	(138)	(55)	(193)	...	...	...
Total for all mines ...	...	4	4	...	1·53	·82	1	10	11	·42	3·60	2·13
Total number of men employed	(2,237)	(2,616)	(4,853)	...	...	...	(2,381)	(2,778)	(5,159)	...	...	...

TABLE No. 22.

Deaths from Accidents of Persons Employed in Gold Mines during 1929, and the Death Rate per 1,000 Men Employed and per 1,000 tons of Gold Ore raised, during 1928 and 1929. (*Number of men taken as in Table No. 18, not including Alluvial Gold Workers.*)

Goldfield.	Number of Deaths.			Death Rate per 1,000 men employed.				Number of Deaths per 1,000 tons of Gold Ore raised.	
	1929.			1929.			1928.		
	Above Ground.	Under Ground.	Total.	Above Ground.	Under Ground.	Total.	Total.	1929.	1928.
1. Kimberley	...	...	...	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...	...	...	...
3. Pilbara	...	...	...	...	...	...	...	...	...
4. West Pilbara	...	...	...	...	...	...	...	...	...
5. Ashburton	...	...	...	...	...	...	...	...	...
6. Gascoyne	...	...	...	...	...	...	...	...	...
7. Peak Hill	...	...	...	...	...	...	...	...	...
8. East Murchison	...	1	1	...	6·28	2·63	...	·636	...
9. Yalgoo	...	...	...	...	...	...	...	...	...
10. Mt. Margaret	1	...	1	5·65	...	2·53	...	·009	...
11. North Coolgardie	...	...	...	...	...	...	...	...	...
12. North-East Coolgardie ...	...	...	...	...	...	...	...	...	...
13. East Coolgardie	...	3	3	...	2·62	1·47	1·03	·007	·005
14. Broad Arrow	...	...	...	...	...	...	...	...	...
15. Coolgardie	...	...	...	...	...	...	...	...	...
16. Murchison	...	2	2	...	10·47	5·46	...	·044	...
17. Yilgarn	...	...	...	...	...	...	...	...	...
18. Dundas	...	...	...	...	...	...	...	...	...
19. Phillips River	...	...	...	...	...	...	...	...	...
Total	1	6	7	·51	2·89	1·75	·53	·011	·003

The number of deaths per 1,000 men employed shows an increase from .53 in 1928 to 1.75 in 1929, and that per 1,000 tons of gold ore raised shows an increase, being .011 as against .003 for the preceding year.

PART VI.—STATE AID TO MINING.

STATE BATTERIES.

The number of State Batteries existing at the end of the year was 21.

From inception to the end of 1929, gold and tin to the value of £6,280,860, have been recovered from the State plants; 1,494,603 tons of auriferous ore have been treated and have produced £5,094,188 by amalgamation, £818,063 by cyanidation, £265,266 by slimes treatment, £9,353 worth from residues and 81,567 tons of tin ore produced tin to the value of £93,417, and in addition a sum of £572 was recovered from residues.

During the year the gold ore treated was 20,236½ tons for 20,123.01 ozs. of bullion.

The working expenditure for all plants for the year totalled £25,894 11s. 0d., and the revenue £16,678 15s. 9d., which shows a loss of £9,215 15s. 3d. on the year's operations.

The capital expenditure since the inception of the scheme has been £414,899 9s. 5d.; £322,918 7s. 9d. from General Loan Fund and £91,981 1s. 8d. from Consolidated Revenue. The cost of administration for the year was £2,564 4s. 1d. as against £2,434 2s. 5d. for 1928.

The working expenditure from inception to the end of the year exceeds the revenue by £178,268 1s. 10d.

GEOLOGICAL SURVEY.

The activities of this branch have been more restricted than usual owing to one of the field officers —Mr. K. J. Finucane, B.Sc., severing his connection with the Department, early in the year to join the Tasmanian Survey. His position has since been filled by Mr. F. G. Forman, B.Sc.

In addition to the usual office work, the Government Geologist has carried out the following field work:—

1. An investigation, in company with the Deputy Government Geologist of South Australia, Mr. R. L. Jack, B.E., of the surface waters problem of the Southern Area of the 3,500 Farms Scheme.
2. An investigation into the occurrence of foul air in the Coronation Cave at Margaret River.
3. The sampling and estimation of the Manganese ore in the Southern Series of the Horseshoe deposits at Peak Hill.
4. An investigation of the occurrence of bitumen on Cheyne Beach.
5. Two conferences at Northampton with Mr. Ferguson, the controller of the Geophysical Survey of the lead deposits of that District.
6. An inspection of a reported tin discovery near Mt. Dockerell (in the East Kimberley Division.)
7. An inspection of the oil bore at Poole Range in connection with the cementing off of the water from the oil sands cut at a vertical depth of 2,085 feet.
8. An inspection of a coal discovery at Nanup, on the Busselton-Bridgetown Railway.

In addition to the field inspection two important reports were also compiled, one of the Gold Resources of Western Australia, for the XVth International Geological Conference, held at Pretoria during July and August; and in conjunction with Professor E. de Clarke, a description and classification of the Pre-Cambrian Rocks of the State made at the request of the Interstate Geological Conference held in Adelaide, May, 1928.

For the greater portion of the year, the assistant field geologists were engaged on the Underground Survey of the Boulder Belt. In addition and in company with Dr. Woolnough, Mr. Feldtmann visited and reported on the Wooramel Area, in connection with the occurrence of mineral oil in that locality.

Owing to an urgent request from the Management of the Great Boulder Perseverance Mine, Mr. Finucane made a survey of the east boundary lode to locate the position between the 1,300ft. and 1,750ft. levels and at the Australia East Lode at and below the 1,750ft. level.

The full reports, together with petrological description of bore cores, etc., except in such cases when the investigation has been made for purely departmental reasons, will be found in the following pages, under Division IV. of this report.

Assistance under Mining Development Act, 1902.

The following statement shows the sums advanced during the year 1929 under the Mining Development Act:—

	£ s. d.	£ s. d.
Advanced in aid of mining work and equipment of mines with machinery ..	3,586 3 8	
Boring	13,015 10 1	16,601 13 9
Subsidies on stone crushed for the public	..	172 12 0
Providing means of transport and equipment to prospectors	..	8,417 14 6
		£25,192 0 3

In addition to the above, the Vote was charged with rebates on water as follows:—

	£ s. d.
Southern Cross Eastwards	46,136 12 9
Ingliston Consols	1,200 4 9
	£47,336 17 6

This arrangement dated from 1st July, 1923, other assistance granted from the Vote during the year on various matters totalled £12,296 17s. 5d. The total expenditure was £84,825 15s. 2d. The subsidies paid on stone crushed for the public amounted to £172 12s. and are subsidies paid to owners of plants crushing for the public, the conditions being that they crush at fixed rates. The ore crushed at these plants during the year totalled 1,584 tons.

The receipts under the Mining Development Act, exclusive of interest payments, amounted to £4,052 8s. 11d. and included:—

	£ s. d.
Refund of Advances	2,131 10 5
Sale of Securities	1,773 6 10
Miscellaneous Refunds	147 11 8
	£4,052 8 11

Liability on guarantees at the end of 1929—£51,500.

PART VII.—REMARKS ON THE GOLDFIELDS AND MINERAL DISTRICTS AND SUMMARIES OF THE WARDENS' AND OTHER OFFICERS' REPORTS.

ASHBURTON GOLDFIELD.

The recovery of nine (9) fine ounces of gold was reported, and in the preceding year thirty-six (36) fine ounces.

There are only a few fossickers at work on this field.

BROAD ARROW GOLDFIELD.

The output of gold was 8,756 fine ounces, and in the preceding year 1,190 fine ounces; an increase of 7,566 fine ounces.

This is the result of the resumption of operations on the Associated Northern Blocks Mine at Ora Banda. From a new discovery at Canegrass a good crushing was reported. Good returns were also obtained at Dark Horse, Waverley and Windanya.

In the various centres of the field systematic prospecting was being done by a large number of men.

COLLIE COALFIELD.

The output of Coal was 544,719 tons, and in the preceding year 528,420 tons; an increase of 16,299 tons.

Six (6) mines were producing during the year, viz., Proprietary, Co-operative, Westralia, Cardiff, Stockton, and Griffin.

At all the mines an active policy of development is being carried out, and the outputs could be immediately increased if the demand justified such. The mines are all in good order, and the district is prosperous.

COOLGARDIE GOLDFIELD.

The output of gold was 3,449 fine ounces, and in the preceding year 6,104 fine ounces; a decrease of 2,655 fine ounces.

This is attributable to poor returns from the St. Ives and Kunanalling centres. At the former, mining is almost at a standstill, and at the latter only a couple of mines are working.

At Gibraltar some good returns were got from the old "Lloyd George" Mine.

In the immediate vicinity of Coolgardie a good deal of prospecting was going on, but no new finds were reported from any portion of the field.

DUNDAS GOLDFIELD.

The output of gold was 1,651 fine ounces, and in the preceding year 4,341 fine ounces; a decrease of 2,690 fine ounces.

There has been little change in this field, but the owners of a couple of properties are very optimistic as to their future. A small amount of prospecting was being done.

EAST COOLGARDIE GOLDFIELD.

The output of gold was 282,550 fine ounces, and in the preceding year 294,955 fine ounces; a decrease of 12,405 fine ounces.

Production by most of the large mines was maintained, the principal contributors being the Lake View and Star and the Great Boulder. During the year the former acquired the properties held by the Golden Horseshoe Company, and it is reported that a large developmental scheme will be inaugurated at an early date.

The North Kalgurli Company again became a regular producer, and is expected to continue and increase its output.

In November a cyclonic disturbance did considerable damage to several mines and caused a suspension of work on some of them for a short period.

A large number of tributers have been working, and many of them have had good returns.

At the North end of the field a considerable amount of prospecting was being done.

At Feysville several parties were at work, and some satisfactory crushings were got.

In the Bulong district the position at Mount Monger was well maintained and good returns were reported, but elsewhere only a few prospectors were operating, and nothing of note was recorded.

EAST MURCHISON GOLDFIELD.

The output of gold was 3,766 fine ounces, and in the preceding year 4,758 fine ounces; a decrease of 992 fine ounces.

In the Black Range district there was a decrease.

At Montague there was a good production, and returns were also reported from Maninga Marley, Sandstone, Youanmi, Currans Find and Hancocks. The centres of Birrigrin and Barambie are both deserted.

In the Lawlers district the only production was from cyanide treatment of sands and slimes. No crushings were reported.

In the Wiluna district there was a small increase.

From Coles Find a few crushings were reported.

At Mount Hilda there were no crushings, the only return being from treatment of sands.

At Diorite the "Brilliant North" and a prospecting area were the only producers.

At Wiluna development work and erection of plant on the property of the Wiluna Gold Mines proceeded vigorously. It is hoped the production stage will soon be reached, when a good increase in the gold output should result.

The completion of the railway to this centre has been a very helpful factor.

GASCOYNE GOLDFIELD.

The production of 78 fine ounces of gold was reported, and in the preceding year 60 fine ounces.

There are only three (3) mining tenements held on this field, hence operations are not extensive.

GREENBUSHES MINERAL FIELD.

The output of Black Tin was 38.30 tons, valued at £4,079, and in the preceding year 54.54 tons, valued at £6,355; a decrease in tonnage of 16.24 tons, and in value of £2,276.

Tantalite to the value of £70 was also reported.

The falling-off in yield is due in large measure to the low prices ruling for tin, as, although there have been considerable fluctuations, the general tendency has been toward lower prices.

Nothing payable was disclosed as a result of the diamond drilling carried out by the Department.

KIMBERLEY GOLDFIELD.

The production of 184 fine ounces of gold was reported, and in the preceding year 40 fine ounces.

There was increased activity in prospecting, and a Reward Claim was granted at Mount Dockerill, from which returns have been reported.

A few men have also been at work searching for alluvial gold.

MOUNT MARGARET GOLDFIELD.

The output of gold was 32,779 fine ounces, and in the preceding year 35,224 fine ounces; a decrease of 2,445 fine ounces.

In the Mount Margaret district there was a small decrease, and although a few prospectors were operating at the various centres nothing of note was recorded.

In the Mount Morgans district there was a decrease, although the tonnage treated was greater. As hitherto, the chief production was from the Westralia Mount Morgans Mine. At the various centres only a few prospectors were working, and the outlook is not promising.

In the Mount Malcolm district there was a small increase. The principal producer was the Sons of Gwalia Mine, which throughout the year was actively worked, and at its close was developing very promisingly.

The diamond drilling on the old Harbour Lights Mine, referred to in last year's report, was done, but nothing of value was encountered.

At outback centres only a little prospecting was going on.

MURCHISON GOLDFIELD.

The output of gold was 23,427 fine ounces, and in the preceding year 23,636 fine ounces; a decrease of 209 fine ounces; also emeralds to the value of £278.

In the Meekatharra district there was a small decrease. The principal producer was the Ingliston Consols.

Most of the output came from the immediate vicinity of Meekatharra, the outlying centres being very quiet.

In the Cue district there was a decrease, and practically no improvement in mining.

In the vicinity of Cue a good deal of prospecting was in evidence.

At Cuddingwarra boring on the "Big Bell' was completed, and the results were encouraging. The owner is now trying to raise capital for future work.

At Reidy's work on the Mararoa Company's leases is at a standstill, pending the raising of more capital.

At Poona mining for emeralds is still going on, and efforts are now centred on proving the lode at depth.

In the Day Dawn district there was an increase, but nothing of note transpired. The chief production was from the "Mountain View" at Day Dawn and the "Mainland Consols" at Lake Austin.

In the Mount Magnet district there was also an increase. Most of the output was from shows in the vicinity of Mount Magnet.

From Lennonville there was a small production.

Nothing was reported from Moyagee or Paynesville.

NORTHAMPTON MINERAL FIELD.

The output of Lead Ore was 1,075 tons, valued at £3,767, and in the preceding year 112 tons, valued at £315; an increase in tonnage of 963 tons, and in value of £3,452. Also 116 tons of copper, valued at £974, but none in the preceding year.

The principal production was from Block 7, at Ajana. During the year a new shaft was sunk on this mine to allow of better development and, it is hoped, increased production. Several other properties were being worked, and at Noman's Well, about 9 miles South-East of Northampton, the holders of a prospecting area have erected a plant and are treating their own ore.

At Galena only a small amount of prospecting was being done. During the year some geophysical investigations were carried out on this field, results of which are not expected to be available for some months.

NORTH COOLGARDIE GOLDFIELD.

The output of gold was 3,750 fine ounces, and in the preceding year 5,774 fine ounces; a decrease of 2,024 fine ounces.

In the Menzies district there was a falling-off. At Menzies itself several good yields were recorded.

At Comet Vale the "Sand Queen-Gladsome" had a very small output, but an improvement in this regard is anticipated.

At Goongarrie and Mount Ida there was practically no mining.

In the Ularring district almost the only work being done was on the "Riverina South," where a programme of diamond drilling was being carried out by the Government. This had not been completed at the close of the year.

At the State Battery, Mulline, there was a small production from the treatment of sands.

In the Yerilla district there were small outputs from the "Neta" and "Golden Heart," at Edjudina. At Pingin there was some activity in prospecting, but at Yerilla and Yarri mining is moribund.

In the Niagara district a small amount of prospecting was being done. The locality known as Twin Hills, where a discovery was made and referred to in last year's report, was found to be in the Menzies district. A few good returns were got from some of the shows.

NORTH-EAST COOLGARDIE GOLDFIELD.

The output of gold was 709 fine ounces, and in the preceding year 1,298 fine ounces; a decrease of 589 fine ounces. Only a few prospectors are working in this field. A new discovery at a locality between Bulong and Kanowna was reported, and although several areas were taken up, the only gold recovered was from the original blocks.

In the Kurnalpi district mining was stagnant; very few men are at work and the return was very small.

PEAK HILL GOLDFIELD.

The output of gold was 1,088 fine ounces, and in the preceding year 1,034 fine ounces; an increase of 54 fine ounces. Most of the output came from mines in the vicinity of Peak Hill.

At all the outside centres only a limited amount of prospecting was going on.

The railway to the manganese deposits at Horseshoe was completed but no work is being done owing to the low price at present ruling, which makes all but the richest ore unpayable.

PHILLIPS RIVER GOLDFIELD.

The output of gold was 190 fine ounces, and in the preceding year 113 fine ounces; an increase of 77 fine ounces. Gold mining was confined to the Kundip centre and only a few properties were being worked.

The copper production was 33.18 tons, valued at £420, but none in the previous year. Copper mining is at a low ebb, chiefly on account of the low market price ruling. The outlook for this field is not good.

PILBARA GOLDFIELD.

The output of gold was 2,309 fine ounces, and in the preceding year 1,946 fine ounces; an increase of 363 fine ounces. Black tin to the amount of 17.86 tons valued at £2,531 was raised; a decrease on the preceding year in tonnage of 17.62 tons, and in value of £2,640.

Asbestos to the amount of 63.70 tons, valued at £6,113 was raised; an increase on the preceding year in tonnage of 52 tons, and in value of £5,331; also 11.27 tons of Tantalite, valued at £3,598; an increase in tonnage of 2.51 tons, and in value of £1,385.

Although there was a small increase in the gold output, there was little improvement in gold mining.

Tin mining was not as active as in the preceding year, merely on account of the low prices. The greatest activity was in Asbestos production, which is encouraging, and it is hoped will be maintained.

In the Nullagine centre matters were very quiet.

WEST KIMBERLEY GOLDFIELD.

No gold was reported from this field.

The work of boring for oil by the Freney Kimberley Oil Company was continued throughout the year excepting for a period when operations were suspended to permit of an examination by the Commonwealth and State Geologists. Indications of the possibility of ultimate success are very encouraging.

Towards the close of the year arrangements were well in hand to open up the iron deposits at Yampi Sound and work should proceed vigorously in the new year. Concessions were granted over large areas in this field for a limited period, the holders having exclusive rights to prospect for minerals other than Gold, Oil and Iron. One party did a considerable amount of prospecting and reported having located valuable mineral deposits.

Further investigations are being made with a view to ascertaining if the reports were unduly optimistic.

Another party also reported having located deposits of various minerals; this also has not yet been confirmed.

WEST PILBARA GOLDFIELD.

The output of gold was 60 fine ounces, and in the preceding year 15 fine ounces; an increase of 45 fine ounces; also 191.25 tons of Asbestos, valued at £8,568, but none in the preceding year.

No copper was produced.

Mining has been very quiet in this field and during the year the proclamation of the Goldfield was cancelled and all records transferred to Head Office.

YALGOO GOLDFIELD.

The output of gold was 2,611 fine ounces, and in the preceding year 6,206 fine ounces; a decrease of 3,595 fine ounces. This decrease is due to the closing down during the year of the Brilliant Mine at Messenger's Patch.

At Goodingow (Payne's Find), the Lake View Gold Mine was a producer, but only a few prospectors were working.

At the other centres there was very little alteration and nothing of note reported.

YILGARN GOLDFIELD.

The output of gold was 4,701 fine ounces, and in the preceding year 5,338 fine ounces; a decrease of 637 fine ounces. Also 761 tons of Gypsum, valued at £761; a decrease in tonnage of 453 tons, and in value of £453.

At Bullfinch, although results were not up to expectations, mining was fairly active.

At Manxman the Radio and Radio Deeps were steady and consistent producers, and this centre produced more than half of the output.

At Burbidge, Marvel Loch, Holleton and other centres mining was rather quiet.

At Westonia mining was active and there was a satisfactory production. A good deal of prospecting was also in evidence.

In the vicinity of Southern Cross a few prospectors were working, but no discovery of note was reported.

PART VIII.—EXISTING LEGISLATION.

At the close of the year the Acts in force relating to mining were:—

1. The Mining Act, 1904 (as re-printed with Amendments).
2. Sluicing and Dredging for Gold Act, 1899.
3. Mines Regulation Act, 1906.
4. Coal Mines Regulation Act, 1902-1926.
5. Coal Mines Regulation Act Amendment Act, 1928.
6. Mining Development Act, 1902-1924.
7. Mines and Machinery Inspection Act, 1911.
8. Gold Buyers Act, 1921.
9. Miners' Phthisis Act, 1922.
10. Miners' Phthisis Act Amendment Act, 1925.
11. Miners' Phthisis Act Amendment Act, 1929.

The following alterations, etc., regarding Regulations were gazetted under:—

The Mining Act, 1904.

Amendment of Schedule of the Regulations Form 57.

Amendment of Regulation 55, Clause (1).

Additional Regulation 173A.

Coal Mines Regulation Act, 1902-1926.

Additional Regulations 52, 53, 54, 55, 56, 57, 58, 59, 60.

Part V.—Appointment of Workmen's Inspector of Mines.

PART IX.—INSPECTION OF MACHINERY.

The Chief Inspector of Machinery reports that the number of useful boilers registered at the end of the year totalled 3,530, as against 3,470 total for the preceding year, showing an increase, after all adjustments, of 60 boilers.

Of the total 3,530 useful boilers 1,949 were out of use at the end of the year; 1,563 thorough and 24 working inspections were made, and 1,521 certificates were issued.

Permanent condemnations totalled 21, and temporary condemnations 58. There were no conversions, and 3 boilers were transferred beyond the jurisdiction of the Act.

The total number of machinery groups registered was 7,675 against 7,224 for previous year, showing an increase of 451.

Inspections made total 5,821, and 3,021 certificates were granted.

Two hundred and ten applications for engine-drivers' and boiler attendants' certificates were received and dealt with, and 179 certificates, all classes, were granted, as follows:—

Winding Competency (including certificates issued under Regulation 40 and Section 60)	3
First Class Competency (including certificates issued under Regulations 40 and 45 and Sections 60 and 63)	8
Second Class Competency (including certificates issued under Regulation 40 and Section 60)	26
Third Class Competency (including certificates issued under Regulation 45 and Section 63)	25
Locomotive Competency	8
Traction Competency	6
Internal Combustion Competency	13
Crane and Hoist Competency	13
Boiler Attendants' Competency	61
Interim	2
Copies	9
Transfers	5
Total	179

The total revenue from all sources during the year was £5,468 1s. 8d. as against £5,127 7s. 3d. for the previous year, showing an increase of £340 14s. 5d.

The total expenditure for the year was £5,341 7s. as against £5,474 18s. 11d. for the previous year, showing a decrease of £133 11s. 11d.

PART X.—SCHOOL OF MINES.

During this, the 26th year of the School's existence, there was a marked increase in the enrolments as compared with the preceding year.

In the proprietary classes the numbers were well maintained. This is doubtless the result of a more optimistic feeling as to the outlook for the industry consequent on the introduction of improved methods.

The high standard of class-work set by the School was well maintained, and the percentage of passes up to the average.

In the experimental plant several metallurgical problems were investigated, the results of which will undoubtedly be of much help to the industry.

The system of free assays for prospectors was continued, a total of 278 assays and mineral determinations having been made.

Details of the work of the School will be found in the report of the Director, Division V. of this Report.

CONCLUSION.

In dealing with the operations of the various Departments I have only briefly commented on the principal items. Full and detailed information will be found in the reports of the various responsible officers, published as Divisions II. to VIII. of this Report.

In conclusion, I desire to acknowledge the loyal support received from all officers of the Department during the year.

I have, etc.,

M. J. CALANCHINI,
Under Secretary for Mines.

Department of Mines,
Perth, 31st March, 1930.

DIVISION II.

STATE MINING ENGINEER'S DEPARTMENT.

DIVISION II.

Report of the State Mining Engineer for the Year 1929.

Office of the State Mining Engineer,
Perth, 27th March, 1930.

The Under Secretary for Mines.

Sir,

I have the honour to submit, for the information of the Hon. Minister, my report on the work of this Branch for the year 1929.

STAFF.

Inspectors of Mines.—The personnel was the same as in the previous year, and consisted of Messrs. W Phoenix, A. W. Winzar, E. J. Gourley, W. M. Doeble, H. P. Rockett, and J. McVee.

Workmen's Inspectors of Mines.—The period of two years, for which the Workmen's Inspectors are appointed, expired in March in the East Coolgardie and Leonora Districts. Elections were held at Kalgoorlie and Leonora which resulted in the re-appointment of Messrs. R. A. Jones and L. C. Darcey for East Coolgardie District, and Mr. C. Byfield for Leonora District, for a further two years from 18th March, 1929.

It is with very deep regret that I have to record the death of Mr. C. Byfield, in September last. He was first elected to the position in 1917 and during his twelve years' occupancy of it rendered good and loyal service. Up to the end of the year, no new appointment had been made.

Mr. R. P. McMennemin's term as Workmen's Inspector of Mines for the Cue District will not expire until 6th June, 1930, when he will be eligible for re-election.

I desire to place on record the loyal and efficient services rendered by the professional and clerical members of my staff and my appreciation of the valuable assistance given by the Government Geologist and the Government Mineralogist and Analyst and their staffs.

INSPECTION OF MINES UNDER THE "MINES REGULATION ACT, 1906," AND THE "COAL MINES REGULATION ACT, 1902-1926."

Report of Mr. R. C. Wilson, B.Sc., B.E., Assistant State Mining Engineer.

I beg to submit my Annual Report for the year ended 31st December, 1929.

During the year a comprehensive diamond drill boring programme was carried out and a large proportion of my time was devoted to the selection of sites most likely to prove successful. The selection of the boring sites has involved a careful inquiry into all records and information at our disposal followed usually by an examination of the ore bodies in the field. Great interest has been taken in this undertaking, and quite rightly so, as I can think of no work more likely to lead to the re-opening of old mines. As a result of the boring operations already carried out, increased interest is now being taken in Tindal's Gold Mine at Coolgardie, the Big Bell Mine at Cue, the Mararoa Gold Mine at Reedy's, and the Old Mararoa Gold Mine at Norseman, and it must not be forgotten that the present activities at Wiluna are the results of successful boreholes.

My other duties included the inspection of mines in connection with applications for assistance under the Mining Development Act, the examination of mineral deposits and the investigation of the claims of one mining centre (Jimble Bar) to have a State Battery erected.

A reasonable amount of office work was also attended to and on four occasions, for periods ranging from nine days to 14 days, I took over the duties of the State Mining Engineer during his temporary absence.

Brief details of the more important inspections made are as follows:—

Galena was visited in January in connection with an application from the owners of Block 7 Lead Mine for assistance to sink a new main shaft. The loan was recommended and approved.

Marble Bar, Bamboo Creek and Middle Creek were visited in February in connection with an application for diamond drill boring in the Pilbara district. After the necessary investigations, boring was recommended at the Prophesy G.M., Bonnie Doon G.M., and the Kitchener G.M., all at Bamboo Creek, also at the Lalla Rookh G.M., at Lalla Rookh and the Barton G.M., at Middle Creek. (See Appendix No. 1.—Report No. 1.)

Jimble Bar was visited in March in connection with an application for the erection of a State Battery. The matter was carefully gone into and reported upon. (Report No. 2.)

Norseman was visited in April and the question of boring at this centre was gone into. A boring programme was recommended and approved. (Report No. 3.)

Mount Morgans Gold Mine was visited in August in connection with a proposal from the owners to carry out boring there. The matter was investigated and reported upon. (Report No. 4.)

An alluvial gold find reported by T. Hughes at the Murray River, near Dwellingup, was visited and reported upon in May. The find proved to be on a Class A. Reserve and the alluvial wash contained a few specks of gold only.

The Riverina G.M. was visited during the same month and two boreholes to prove the value of the lode at depth were marked out on the ground. (Report No. 5).

A new tin discovery, reported by Messrs Moller and Thompson at Holleton, was visited and reported upon in August. (Report No. 6.)

A Mica deposit at Mullalyup, owned by M. Oliver (P.A. 486H), was inspected and reported upon in September. (Report No. 7.)

A Felspar and Beryl deposit at Ferndale, which is described in the Annual Report of Department of Mines for 1925, page 82, was re-visited and reported upon. (Report No. 8.)

A visit to Kalgoorlie was made in October in connection with a proposal submitted to the Hon. Minister to carry out some diamond drill boring at the North end of the field. In particular it was urged that boring be carried out at the Hannans North G.M. The matter was investigated and reported upon. (Report No. 9.)

Ora Banda was visited in October and inspections were made of the Gimlet Mine, Golden Mount, and Wolfram Find. (Report No. 10.)

Mt. Magnet was visited in November in connection with the boring in progress at Mt. Zion. A proposal to bore at Hill 60 was investigated at the same time and reported upon. (Report No. 11.)

Meekatharra was also visited in November in connection with the proposed boring at that centre. The matter was carefully gone into and reported upon. (Report No. 12.)

SUMMARIES OF REPORTS OF INSPECTORS OF MINES.

Mr. W. Phoenix, Kalgoorlie.

Dust.—During the year, dust surveys have been made at Kalgoorlie, Wiluna, and Ora Banda Mines and Darling Range quarry plants. Altogether about 2,500 dust samples were taken and counted under the microscope. General average results for Kalgoorlie mines have been as follows:—

For year	1926	.. ..	370 p.p.c.c.
„	1927	.. ..	306 „
„	1928	.. ..	247 „
„	1929	.. ..	190 „

Dry Crushing Plants, Kalgoorlie Mines:—

For year	1927	.. ..	228 p.p.c.c.
„	1928	.. ..	186 „
„	1929	.. ..	182 „

I am pleased to report that there is a more favourable attitude towards the regulation of firing underground.

Ventilation.—Attention, which is required to be given to the direction of air currents and air volume, is becoming greater owing to the irregularities of the currents. The lateral pressure on air courses at depth is very marked and retards the air flow, necessitating a more diligent supervision of the maintenance of the air ways.

Temperatures.—During past years I have emphasised that greater attention should be given to maintenance of as large a difference as possible between Wet and Dry Bulb thermometer readings. It is pleasing to note that better attention is now being given to this important factor, which indicates the evaporative capacity of the air underground.

Close attention has been given to recording temperatures in all working faces. During the past year about 1,000 temperature readings have been recorded in the various mines throughout the district. Venturi and other blowers are proving effective when air mains reach to within a few feet from the working face, and give air movement and evaporation plus a reduction in dust quantities.

The opportunity has also been taken of urging the necessity of using water where it is most effective in laying dust where it is created.

Miners' Phthisis.—There is evidence that conditions with regard to dust prevention and dust allaying have improved. A further improvement is hoped for in an endeavour to eliminate silicosis from our mines.

The Laboratory Staff, with the mobile X-ray apparatus, did not visit the outback centres this year, but the Officer in Charge, visited Carbine, Ora Banda and Mt. Monger districts.

Unremitting efforts must be continued to combat this disease and regulations that will embrace measures to prevent accumulation of dust will help to eradicate miners' phthisis.

Rock Drills.—Rock drills are the cause of most of the complaints arising from dust. I am impressing upon the miners that a more skilful use of water is essential and that it must reach the cutting edge of drills in adequate quantities. The type of machine now in use requires a good deal of water.

The rate of boring has considerably increased, hence the urgent necessity for increasing the air flow through blowers in order to maintain a safe atmosphere at the face.

Accidents.—These occur from very many and various causes. Ninety per cent. of the minor accidents are very trivial and should not be recorded. They appear to be increasing each year. It is perplexing to note that although workings in which men are employed are much safer, minor accidents increase steadily.

During the year several accidents have occurred as a result of careless handling of detonators, and investigations are being made relative to the cause.

Sanitation and Safety Appliances.—Observations have been made with regard to safety appliances and sanitation underground. Complaints have received attention and the workings kept in a hygienic condition.

Earth Tremors.—There were very few earth tremors during the past year, and no indication of any damage to the present workings. The tremors are becoming less frequent.

General.—During the year the requirements of the Act have received attention and the mines have been regularly inspected.

The provisions of the Mines Regulation Act have been fairly well complied with, there being no prosecutions for the year.

The general outlook is more promising and schemes of development undertaken show promise.

The reports of Messrs. A. W. Winzar and E. J. Gourley also deal with Kalgoorlie mines, in addition to those in outlying districts.

Mr. A. W. Winzar, Kalgoorlie.

Mt. Margaret.

Very little change has occurred, and no new finds reported. About the usual amount of prospecting has been done, and most parties are assisted by the State. Each year prospecting gets more difficult as the ground has been well gone over for years, and there is little chance of finding anything at the surface.

The Sons of Gwalia, Limited, continued throughout the year. A large proportion of oxidised ore came from open cuts above 200ft. level and the grade was in consequence low, being 22.72s. per ton. 3,046 feet of development work was done under Government loan, in addition to 2,164 feet, making a total of 5,210 feet. The main shaft was sunk to 4,050 feet, and sinking suspended for the time being. The development work carried out was very satisfactory, and has greatly improved the position of the mine.

The South Gwalia shoot was found at the 21 and 22 levels and is opening up well, and work is being undertaken to cut it at the lower level. On the 25 level over 1,000 feet of milling ore has been proved, and ore still in the face.

The ventilation has been improved, and good air is now circulating through the bottom stopes, and konimeter tests prove the air to carry a low dust content.

At *Malcolm* a small cyaniding plant is being erected to treat the old sands on the "Star."

At *Lawlers* cyaniding of the "Waroonga" tailings was continued with success.

At *Corboy's Find* the "Waratah" continued mining, and have a large parcel to treat.

Very little work was done around the *Laverton* District.

At *Morgans* the sand dump on the "Westralia" was given a trial test, which proved them to be payable with a modern treatment plant.

Kalgoorlie.

Approximately two-thirds of my time is spent in this centre in the deep mines and surface plants. Attention has been given by my colleagues and myself to the well-being of the men employed and the care of the ventilation and dust suppression. Ropes and electrical appliances have been well watched, strict attention has been given to the earthing and insulation in the electrical gear. One serious burn-out occurred in the transmission lines from the Power Station where they passed under the railway line. These have now been taken overhead, and the cause of much worry in the past has been removed.

Lake View and Star Group are effecting a vigorous development policy and improving their surface equipment.

At the Chaffers a new sampling unit is about finished, and will be used for tributers' parcels.

A flotation plant is also to be erected, and the foundations are now being put in.

On the Horseshoe a retreatment plant is about finished. The sands will be sluiced into vats and filtered through Oliver filters, and the gold solution precipitated by the Merrill-Crowe process. Costs are estimated to be under 2s. per ton, and 40,000 tons a month will be treated.

With regard to the immediate future of mining in Kalgoorlie, I think we can say the operations during the year have shown that the field is not going back, and I feel confident that the future will show a big improvement with some of the mines. The Croesus, North Kalgurli and Enterprise should each improve, whilst the Lake View and Star Group appear to me to be the making of a large and profitable ore producer.

The officials are giving great attention to the geological features of the field, and also to the science of ore reduction and gold extraction, and we can expect some interesting results therefrom.

Mr. E. J. Gourley, Kalgoorlie.

Development Work in Kalgoorlie Mines.

Associated Gold Mines.—Values disclosed by the development work have been low grade with the exception of Nos. 2 and 3 levels, where good ore is being stoped. The mine is very economically managed, and the old type of drill is still in use.

Boulder Perseverance, Limited.—A considerable amount of exploratory work, by means of drives, winzes, crosscuts and diamond drilling proved, to some extent, satisfactory values, but very little stoping has been done. Ventilation and suppression of dust underground are well looked after. The erection of new treatment machinery is under consideration.

Enterprise G.M. (late Boulder No. 1).—The lode has been developed to the 500ft. level, disclosing a good quality of ore worth 32s. per ton. Communication has been established with the "Hainault" Mine, resulting in well ventilated workings. From the 773 ft. level two diamond drill holes were bored, one horizontally due West and the other at a depressed angle in a South-Westerly direction. Both intersected the lode channel, but values have not been announced. The option for purchase to an Adelaide syndicate has not yet expired.

Great Boulder Proprietary Gold Mines, Limited—Edwards' Shaft.—The 800ft. level is being continued with the expectation of locating the East lode, which should be fulfilled in another 30 feet. In the levels above the pay ore averaged about 9 dwts to the ton.

Main Shaft, 1,600ft. level.—On the counter vein the ore is 6 feet in width, worth 10 dwts. From the indications in the 1,500ft. level pay ore should be developed for another 350 feet in length.

By arrangement with the Boulder Perseverance management, prospecting is being carried on from the 900 and 1,750ft. levels in a Westerly direction, with the object of proving the value and width of what is known as the "X" lode, in the Great Boulder ground.

Work underground is chiefly confined to tributes, with very good results from a number of the parties.

It is estimated that approximately 80,000 tons of ore, averaging 9.5 dwts, have been developed as a result of the year's operations.

Lake View and Star Group: "Chaffers".—The shaft, enlarged to four compartments is being deepened below the 2,300ft. level. A large sampling bin has been added to the plant, and re-treatment of "Ivanhoe" residues continued.

"Hannans Star."—There is nothing of importance resulting from the development work to record.

"Horseshoe."—A section of the development work has been carried on from the "Horseshoe" shaft in what is known as "Chaffer's Deeps." This has been done from the 2,800ft. level, opening up the known lodes, but there has been very little ore stoped. The upper workings are let on tribute. In another portion of the mine a discovery was made at a depth of about 40 feet, which is apparently a continuation of the alluvial worked down from the "Great Boulder" outcrop. Some good values have been encountered near the "Great Boulder" boundary by diamond drilling from the bottom levels.

"Ivanhoe."—This mine is mostly in the hands of tribute parties, and only a slight developmental programme has been attempted.

"Lake View."—Operations have been confined chiefly above the 2,100ft. level with the object of developing known ore bodies. At the 300ft. level, what is supposed to be a continuation of the "Duck Pond," which yielded rich returns some years ago, has been discovered. Some good seams of telluride have been exposed, but sufficient work has not yet been done to prove any length of ore. A number of tribute parties are at work in the shallower levels, with good results.

North Kalgurli Company.—On the "Kalgurli" Mine a considerable amount of development work was done during the early part of the year, but operations were curtailed and energies concentrated on to other leases held by the same company. The "Union Jack" lease was equipped with a small plant to unwater the workings with a view to prospecting from the 400ft. level. On the "Genevive" lease connections have been made with the main shaft, and the underground ventilation considerably improved. As a result of an extensive development campaign, satisfactory results were obtained over varying lengths and widths. Considerable additions were made to the surface plant.

South Kalgurli Consols.—A vigorous development policy was pursued and values revealed, although not high grade, were sufficiently encouraging. A "snap" occurred around the shaft between the 1,400 and 1,600 feet levels, but the damage has been made good, and complete repairs were finally effected when a general overhaul took place during the annual exemption. The Merrill-Crowe process for the precipitation of gold will shortly be put into full operation.

Croesus Proprietary (Eclipse).—This mine has been reconditioned, and from 800 to 1,000 tons of ore per month are being treated which are obtained from the stopes over the 1,000ft. to the 400ft. levels. Mechanical scrapers, worked by air hoists, are used in the stopes to distribute the filling.

Hannans Reward.—Low grade ore from the East wall of the old opencut has been treated by Messrs. Hunt Bros. As the ore can be economically handled a small profit is being made.

North End.—With the exception of a small rich patch unearthed by Messrs. Stahl and Party, there is nothing of importance to record.

Broad Arrow District.

Up to 20 men have been employed prospecting around Broad Arrow. One fair patch of gold was obtained from the old Reisons Reward indicator and from the Oversight and Tara, some rich stone was dollied. Three crushings from the "Bent Tree" lease yielded highly satisfactory returns, and there is still some ore left to work. On a Prospecting Area to the north of the "Bent Tree" some prospecting, which was done with assistance under the Mining Development Act, resulted in a short shoot of ore being located from which 100 tons were crushed, and then abandoned. It has since been taken up again. Operations were resumed at the "Wentworth" mine in December after being idle for some months. At the "Gimlet," another make of ore appears to be coming in over the 700ft. level. The old "Golden Mount" lease was repegged, and 52 tons of ore were crushed for a return of 6 dwts. 5 grs. over the plates. At 124 feet deep the reef being driven on contains fair values. There is a belt of country some four miles in length, in this locality, in which some good shoots of ore should be discovered during the coming year.

North Coolgardie Goldfield.

Menzies District.—In the vicinity of the old "Crusoe" Mine two parties of prospectors have been working some leaders and formation, and have broken out some good crushings. The country north to the "Lady Sherry," and some distance beyond, is getting a good overhaul. On the old "Golden Age" Mine a small compressor has been installed, and a party of five men in addition to the owners have been employed in extracting high grade ore. At the "Warrior" there is a reef in the bottom of the shaft (250 feet) about three feet wide which is worth about 2 ozs. to the ton. Several other parties are at work in the district.

General Remarks.

At Bulong, Canegrass, and in the Mount Monger district discoveries were made which attracted considerable attention and the usual rush, to peg out claims in close proximity, occurred, but anything of a permanent nature has yet to be proved. There are a number of small propositions in which comparatively rich narrow seams are worked, scattered throughout the Goldfields, from which small crushings are obtained at more or less irregular intervals.

There is a better outlook in regard to the Kalgoorlie mines for increased production in the coming year, but of the prospects in the outback centres, with perhaps the exception of Menzies district, there is nothing very encouraging to note.

Mr. W. M. Deeble, Cue.

Report on mining operations on the Peak Hill, Murchison, and Yalgoo Goldfields and the Sandstone and Wiluna districts of East Murchison Goldfield for the year 1929.

Murchison Goldfield.

On the north end of this district is situated the Jimble Bar area, which is just inside the south boundary of the Pilbara Goldfield and 216 miles

north of Peak Hill by road. During the last three years from 12 to 15 prospectors have been engaged continuously opening up the various shows, but owing to the great distance from any treatment plant, they have not been able to get any returns from the ore broken. The Jimble Bar Lode Mine is particularly promising. At a recent visit, the Hon. Minister offered to supply crushing facilities on certain conditions and there is now a more hopeful spirit prevailing at the place.

Between Jimble Bar and Peak Hill, a number of copper areas were pegged during the year, only to be abandoned again when the drop in copper market occurred.

At Peak Hill there has been an average of fifteen men engaged in mining and twelve in Horseshoe, Murphy's Well, and Mt. Fraser districts.

Meekatharra.

The principal mine in this district is the Ingliston Consols Extended, which now includes within its boundaries the once famous Fenian Mine. The main shafts are connected near the bottom, which facilitates mining operations and makes for good ventilation of main drives. This mine employed an average of 104 men throughout the year and treated 29,995 tons of ore. The main tonnage treated came from the mine generally, but the lower levels have been forced ahead. Towards the end of the year high values were met with at 1,150ft. and 1,367ft. levels and although the high values did not continue, it is yet to be proved what payable ore has been added to the ore reserves.

The Lady Central Mine, situated to the North of the Ingliston Consols Extended, was worked up to the end of August last by the owner, D. Rinaldi, who took out from the 100ft. level 168.65 tons, which when treated at the State Mill returned 1,041.56 ounces of gold over the plates. From August the Gold Venture Ltd. held the ground under option and carried out prospecting and development work at 160ft. level, and put a winze down 23 feet to water level. During the progress of the work 135½ tons of ore were raised from development work only which, when treated at the State mill gave 126.6 ounces of gold over the plates.

There are a number of small shows at present around Meekatharra getting high values.

Cue.

The Emu Gold Mine closed down towards the end of the year and it was reported that consideration was being given to the purchase of more efficient machinery.

Tuckabianna.

There are a number of prospectors in this district. One show, the Buttercup, is producing a fair tonnage of low grade ore. The last lot of 474.25 tons completed at the end of October, gave 139ozs. 6dwts. over the plates.

Day Dawn.

Chesson Bros. are producing some high grade ore from the Mountain View Mine. The last crushing of 34½ tons returned 256ozs. 15dwts.

Poona.

The Star Emerald Mining Syndicate is sinking a shaft to prove if the grade of emeralds will improve in quality with depth.

Mt. Magnet.

Hill 60 Mine has been the only one employing men on wages and paying its way. Some of the miners have done very well working on the contact veins but there has not been anything sensational to report.

East Murchison Goldfield.

Wiluna.—There is very little to report from the Wiluna district outside the work being carried out by the Wiluna Gold Mines, Ltd., and this briefly may be considered as preparatory and mine development. One very pleasing feature is the provision of ample supply of fresh air for underground use. One 40,000 cubic feet blower has arrived on the mine and is to be installed at once which, together with a 15,000 cubic feet blower also on the mine will give 55,000 cubic feet for the time being. The manager informed me that two others were on order and would be installed as they arrived. Each 40,000 cubic feet blower is estimated to take 60 H.P. to drive. The main shaft is now completed to a depth of 600 feet and further sinking is being held up until the ore passes and ore bins from the 290ft. and 450ft. levels have been completed. Large haulage ways are well advanced at 290ft. and 450ft. levels.

Sandstone.—There are a number of prospectors scattered over a large area in the Sandstone district. At Maninga Marley, Paskov and Party were the only ones to get anything worth mentioning. A parcel of 12 tons returned 92ozs. 18dwts.

Jones' Find, situated 60 miles north of Sandstone, is almost deserted, but one party is getting high returns from P.A. 988. Scott and Mate crushed at the last run of the State Mill 28½ tons for 376ozs. and a previous crushing of 26 tons returned 75.8ozs.

Yalgoo Goldfield.

The Lake View Mine, at Payne's Find, has been worked continuously throughout the year and is still turning out high grade ore, but, unfortunately, all the other shows have ceased operations. Field's Find and Warriedar are quiet and only a few prospectors are working.

When I visited Retaliation at the latter end of October last, four parties were working shows and altogether there were eleven prospectors.

Other shows were being worked at a place situated about twelve miles south-east of Yalgoo.

Northampton Mineral Field.

On my last visit, a party was working fair grade lead ore at Norman's Well, and at Galena the Block 7 Mine and Salter and Sons were on good grade ore, but the general difficulty is that unless galena can be found of very high percentage in the lodes, it does not pay with the present market value.

Mr. H. P. Rockett, Southern Cross.

The mines and quarries in Inspector of Mines District No. 2 were inspected as often as practicable. Breaches of the Mines Regulation Act were infrequent and of minor importance, and legal action was

unnecessary. All the foreigners employed in the mines in this district speak English fluently, and many of them are naturalised.

Several hundreds of feet of diamond drilling were done on the Carbine and Mararoa Mines; details of these operations are not recorded in this office, but will be found in another part of the Annual Report.

In the Coolgardie Goldfield the Carbine Mine continued to be a steady producer, and there is a good chance that Messrs. Carson and Webster's P.A. 2452, at Burbanks, which has yielded over 70 ounces since July, may improve in the near future.

Messrs. Walsh and Party opened a new lense of ore on the Lloyd George Mine at Gibraltar, and took out 368 tons of ore which returned 617 ounces of fine gold.

Mining at Logan's Find, Widgiemooltha, and Higginsville was very quiet.

At Norseman, the Mararoa Mine was partly closed for most of the year, owing to an accident to an engine, but there was considerable activity at the Golden Butterfly Company's Mine, where 500 feet of ore over 6 feet wide was exposed. This development is reported to carry 45s. per ton. The Viking Mine also was reopened, but no considerable body of pay-ore is reported.

The O.K. Mine continued to yield profitably.

In the Yilgarn Goldfield, the Radio Mine produced consistently, but there are no indications of any likely reduction of output in the near future. The latest exploratory work shows the lode persisting strongly. The Radio Deeps also yielded a satisfactory surplus over working expenses.

In the Southern Cross district mining has been very quiet, and at Marvel Loch and Burbidge there was only a very small yield. Holleton was quiet owing to a shortage of water. The new dam was not completed till after the rainy season, and did not conserve any water. The Glenelg Queen Company's five-head mill is completed on the mine, and ready to drop the stamps immediately sufficient water is available. A more detailed examination of a tin-bearing pegmatite intrusion reported from Holleton showed that it contained less tin than was at first thought, and is probably too low-grade for further exploitation. At Westonia, the Edna May Consolidated, after having been purchased and worked by McCahon's Company, ceased operation towards the end of the year. The Royal Flush Mine was equipped with winding engine and 6-drill compressor, and the shaft sunk to (now) 190 feet. At the 150ft. level the lode was found to be 11 feet wide, and is reported as of highly payable grade.

Mr. J. McVee, Collie.

The following mines produced coal during the year:—Proprietary, Co-operative, Westralia, Cardiff, Stockton, and Griffin.

The total output for the year was 544,459 tons, valued at £426,482 as against 528,420 tons valued at £420,141 in 1928, being an increase of 16,039 tons valued at £6,340.

This amount could have been considerably increased, but there was no more demand for coal, and a large number of shifts were lost owing to want of trade. During the year development work was carried out systematically, and the mines are now in a better position for increased outputs than they have ever been. Unfortunately faulting occurred in the Co-operative, Westralia, Stockton and Griffin Mines, which seriously retarded development.

Proprietary.—This mine continued the dip heading, which has been standing for some years owing to the supposed proximity of Wallsend fault. but according to the direction of the fault and the distance already driven, the heading is well past the line of fault and still in good coal. The output of this mine is nearly 700 tons per shift, and work is being carried out for the installation of an endless rope which will be capable of dealing with from 1,800 to 2,000 tons per shift.

Co-operative.—The area which was sealed off in this mine in January, 1928, was opened on 9th February, 1929, and an attempt made to explore the workings. Before breaking the two seals, a fan capable of producing 30,000 cubic feet of air per minute was erected at the return stopping to provide an adequate supply of fresh air to the workings. Exploration work was carried out for a week, but owing to the heavy falls encountered, and the likelihood of these firing, it was decided to recover all available pit material, and seal the area off again. This was done, and on 4th March a pair of headings were started to go down between the old mine workings and the sealed off area for the purpose of reaching a large field of coal. A distance of 20 chains had to be driven before any attempt could be made to open out. In driving this distance two faults were encountered, one a downthrow of 12 feet and the other an upthrow of 16 feet. These were crossed and the headings are now down far enough to open out another heading for winning out places. Preparations are also being made for the installation of an endless rope for dealing with a large output.

Westralia.—Development work is being pushed ahead through a 40ft. upthrow, and the prospects are very encouraging, the coal opening up well through the fault.

Cardiff.—Development work is being pushed ahead here also, and the mine is in a position to produce 500 tons per shift if required.

Stockton.—Unfortunately this mine has also struck a fault which has crossed the main tunnel and cut off work in this direction. Boring operations are proceeding on the surface with a Calyx drill to try and locate the coal again. The output at present is about 300 tons per day, and this amount can be easily increased, but unfortunately the trade has not been sufficient for every day work.

Griffin.—Development work was commenced in the main tunnel which had been standing for some time on a fault. The prospects in this mine are somewhat retarded owing to faults and the steep nature of the seam which make the handling of the coal a difficult proposition.

General.—An active policy of development is being carried out at all the mines, and they are now in a position to increase their output at any time if

required. At the Stockton and Griffin Mines second outlets have been commenced, and will be finished about the end of March. Working conditions at the mines have been good, and there have been very few complaints relative to them.

There have been no prosecutions during the year.

Nine permits were granted during the year for work on Sunday, principally for the relaying of rails which could not be done while the pits were working.

There were no machinery accidents.

ACCIDENTS.

Mining accidents for the year 1929 are classified in Tables 20, 21, and 22, the previous years figures being given for comparison, and are forwarded herewith for inclusion in your annual report, together with a diagram of the fatal accidents year by year and their causes. (See Division 1, Report of the Under Secretary for Mines.)

The following table gives the number of fatal accidents recorded during the last five years:—

—	1925.	1926.	1927.	1928.	1929.
Fatal accidents to men engaged in mining	12	7	16	4	11
Total men engaged in mining (average)	6,011	5,437	5,036	4,853	5,159
Accident death rate per 1,000 men	2·00	1·29	3·18	·82	2·13
Fatal accidents on quarries reported	...	...	...	...	...
Total men engaged in quarrying	337	291	598	695	691
Accident death rate per 1,000 men	...	...	...	...	...

The following table shows all the fatal and serious accidents reported to this office during 1929, and are classified according to the gold or mineral field in which they occurred. The causes of accidents are also shown:—

—	Explosives.		Falls of Ground.		In Shafts.		Miscellaneous Underground.		Surface.		Total.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1.—East Coolgardie	...	6	...	5	1	10	2	75	...	40	3	136
2.—Mt. Margaret	...	...	...	...	...	1	...	16	1	9	1	29
3.—Murchison	...	...	2	...	...	...	...	13	...	9	2	22
4.—East Murchison	...	1	...	...	1	1	...	8	...	14	1	24
5.—Coolgardie	...	...	...	...	...	...	...	...	...	...	...	...
6.—Yilgarn	...	...	...	...	...	...	...	...	...	2	...	2
7.—North Coolgardie	...	1	...	...	...	...	...	1	...	...	...	2
8.—North-East Coolgardie	...	...	...	...	...	...	...	...	...	...	...	...
9.—Broad Arrow	...	...	...	...	...	...	...	...	...	...	...	...
10.—Dundas	...	...	...	...	...	...	...	...	...	...	...	...
11.—Pilbara	...	...	...	...	...	...	...	...	...	...	...	...
12.—Peak Hill	...	...	...	...	...	...	...	...	...	...	...	...
13.—Yalgoo	...	1	...	...	...	1	...	...	...	...	...	2
14.—Phillips River	...	...	...	...	...	...	...	...	...	...	...	...
15.—Collie	...	2	1	18	...	...	3	82	...	9	4	111
16.—Greenbushes	...	...	...	...	...	...	...	...	...	...	...	...
17.—Northampton	...	...	...	...	...	1	...	...	...	...	...	1
18.—West Pilbara	...	...	...	...	...	...	...	...	...	...	...	...
19.—Swan	...	...	...	...	...	...	...	...	...	32	...	32
20.—Ashburton	...	...	...	...	...	...	...	...	...	...	...	...
21.—Roelands	...	...	...	...	...	...	...	...	...	...	...	...
22.—Kendenup	...	...	...	...	...	...	...	...	...	...	...	...
23.—State generally	...	...	...	...	...	...	...	...	...	...	...	...
Totals for 1929	...	11	3	23	2	14	5	195	1	115	11	358
Totals for 1928	...	7	1	19	1	6	2	212	...	91	4	335

FATAL ACCIDENTS.

A brief description of each accident is given hereunder:—

Falls of Ground.

A miner was killed by a fall of rock from the hanging wall in an opencut. Deceased and his mate had just completed barring down all loose ground after firing, when about half a ton came away without any warning.

Another fatality occurred while precautions were being taken to make a stope safe after firing; a small piece of rock fell, striking a miner on the head while he was barring down dangerous ground.

Two men were just finishing a shift when about two tons of coal fell burying one man and injuring his mate. The place was well timbered, and there was no evidence of neglect.

In each of the above accidents the jury returned a verdict of accidental death with no blame to anyone.

In Shafts.

A man fell from a ladder in a shaft 70ft. deep when he was returning to the surface, and was found dead at the bottom of the shaft.

A skid entering a skip containing eight men caused the death of one man and injured four of the other

men. Upon examination of the shaft it was thought that a bolt holding the end of the skid came loose or broke when the last skip of ore was being raised.

In both instances, a verdict of accidental death, with no blame to any person, was given by the jury.

Miscellaneous Underground.

A trucker was buried by dirt through the collapse of the bearers carrying a Chinaman chute. It was found that the bearer which snapped was short-grained, and the rush of the ore above broke four other bearers. The timber was new when it was placed in position, and the work done satisfactorily.

A machine miner was seriously injured when a piece of rock fell from the roof of stope on to the machine bar and glided towards him. He died a week later. The ground was considered safe, and all care appears to have been exercised.

An unfortunate accident occurred when a coal miner knocked his head against a prop while he was walking along a bord. Although complaining of pains in his head, he continued working for four days after the accident. He died three weeks later before an operation could be performed.

A coal miner strained his heart whilst lifting an empty skip, which caused his death three days later. The least exertion may have caused his death at any time.

A minor accident, which was not at first reported, caused the death of a miner. A piece of coal fell from a skip on to his finger. The wound became poisoned, and he died 12 days later.

The jury returned verdicts of accidental death in the first four instances, but no inquest was considered necessary in the last case.

Surface.

This accident was not witnessed by anyone, and the unfortunate man was found with his right arm and shoulder caught in the teeth of the cog wheels of agitating vat. He probably overbalanced while screwing up the grease cup, and his arm was drawn in up to the shoulder before the agitator stopped. The jury found that no blame was attachable to any person.

SERIOUS ACCIDENTS.

More than one-third of the accidents which are classified as serious when the injured person is absent from his work for 14 days or more, occurred in the East Coolgardie Goldfield, about one-third in the Collie Coalfield, and the remainder in the other goldfields, as shown in the foregoing table. A large number of the accidents were really of a minor nature, such as bruises, cut and jarred fingers, etc., and only a small percentage could be considered as accidents of a more serious nature, such as breakages of the larger bones, permanent injury to limbs and injuries which would cause lasting disabling effects.

Explosives.

The detonator accidents are mentioned on Page 45 in the Report on Lead Azide Detonators.

Two men narrowly escaped very serious injury at Collie when an explosion occurred while they were trying to remove the lid of a powder canister. In two other cases the injured men stated they were shovelling ore when buried detonators were struck. Another workman was overcome by fumes after firing out.

Falls.

The majority of these accidents were reported from Collie through small pieces of coal falling. In only a few cases large falls of rock occurred, the men sustaining more serious injury, such as fractured skull, fractured arm and leg; one accident was due to the snapping of a pillar of rock, the flying pieces of rock striking the workman who was nearby.

In Shafts.

Four men were injured when the skid which had worked loose, caught in the top of skip, which was being raised. A shift foreman was caught between the top of cage and shaft when alighting; and a fall of 30 feet from a ladder was the cause of another shaft accident. Two men sustained serious injuries when a bucket, in which they were being raised, fell 30 feet to bottom of shaft through the hoist driver accidentally releasing the clutch. Other accidents occurred while men were engaged timbering and repairing shafts.

Miscellaneous Underground.

Over fifty per cent. of the accidents were classified under the above heading. In most cases the injuries were sustained while men were handling and loading trucks and skips, slipping while trucking and lifting derailed trucks, handling sharp stones, tools, rock drills, coal-cutting machines, stones running down rills and ore chutes, and falling from stages, ladders, in rills and passes.

Surface.

Men working on the surface were injured through handling firewood, timber and parts of machinery, tools they were using falling or slipping, falls in the course of their work, and being struck by trucks and skips.

Full inquiries were made by Inspectors of Mines into all accidents, and every reasonable precaution was taken for the safety of the men.

WINDING MACHINERY ACCIDENTS.

(Without serious injury to persons.)

During the year, eleven accidents to winding machinery occurred, and included three overwinds, three breakages of ropes, one skip derailment, and four miscellaneous accidents.

Following are brief particulars:—

Overwinding.

(1) During the temporary absence of an engine-driver from the operating platform, a fireman who was learning to drive the engine was bailing water when the north tank was overwound, and the rope broke. He was knocked off his platform and before the engine could be stopped, the other tank had fallen to the bottom of the shaft. Considerable damage was done to the engine room and winding engine. After full inquiry, it was decided that no further action be taken.

(2) An engine-driver allowed an engine to run away until the rope snapped off at the drum. Thorough investigation was made and an inquiry was held under Section 48 of Engine Drivers' Regulations which resulted in the engine-driver's certificate being cancelled.

(3) An empty cage was overwound through an engine-driver misjudging the speed of the engine which was travelling very slowly. The safety appliances acted, and no damage was done to gear or shaft.

Skip Derailments.

It is pleasing to note the improvement in the number of skip derailments, only one minor accident being recorded.

Ropes.

In two cases, where breakages of ropes occurred, bailing operations were being carried out in a shaft where the water is corrosive. The breakages were caused by internal corrosion, although the ropes had been kept clean and well oiled, and showed no signs of heavy wear.

In the third case, hauling operations were in progress when the rope slackened and it was found that the skip was hung up through a skid coming out. The rope was slightly kinked and the damaged portion was cut off.

Miscellaneous.

(1) A skip became detached from the rope when the link attached to the main pin broke, showing faulty welding. No damage was done to shaft timbers.

(2) A rope was slightly damaged when the grippers acted and hung up the cage 900 feet from the surface. It was raining very heavily at the time and the engine-driver did not notice at once that the cage was caught.

(3) While ore was being hauled to the surface, the eye of a safety hook carried away. The safety grips acted and no damage resulted.

(4) During hauling operations, a truck upset in a cage and jammed in wall plates of shaft. No damage was done to cage or winding ropes.

AMENDMENTS AND ADDITIONS TO THE REGULATIONS UNDER THE "MINES REGULATION ACT, 1906," "COAL MINES REGULATION ACT, 1902-1926," AND "MINING DEVELOPMENT ACT, 1902-1924."

Mines Regulation Act, 1906.

Amendment of Clause 5, Division 2 of Regulation 15, relating to payment of Workmen's Inspectors of Mines. (Gazetted 15th November, 1929.)

Coal Mines Regulation Act, 1902-1926.

Additional Regulations 52, 53, 54, 55, 56, 57, 58, 59, and 60. Part V.—Appointment of Workmen's Inspectors of Mines. (Gazetted 8th March, 1929.)

PROSECUTIONS FOR BREACHES OF THE MINES REGULATION ACTS AND REGULATIONS.

A manager was prosecuted for having employed a person who had not first obtained a certificate from a medical practitioner to show that he was not infected with tuberculosis; contrary to Regulation 6 (b) Mines Regulation Act, 1906-1915. He was fined £2 with 3s. costs.

Other cases of alleged breaches of the Acts were brought under notice, but after thorough investigation no action was taken apart from warning the persons concerned.

EXEMPTIONS FROM SECTION 31, SUBSECTION 4, OF MINES REGULATION ACT, 1906."

During the year, four permits were issued, all of which were for mines in the East Coolgardie Goldfield.

The Inspector of Mines first satisfied himself that the applicants were capable of handling the machinery to which the exemption applied and that it was not reasonably practicable to insist on Certificated engine-drivers being employed.

SUNDAY LABOUR IN MINES.

Thirteen permits were granted for Sunday work during the year. In nine instances, permits were issued to mines in the Collie Coalfield for the purpose of relaying, regrading, and general maintenance of main haulage roads. Three permits were issued in East Coolgardie Goldfield, owing to breakdown of motor power, for repairs to furnace, and bailing water to cope with development work. In the East Murchison Goldfield, a permit was given for Sunday work to avoid loss of time in the subsequent working of the mine.

LOANS AND SUBSIDIES UNDER THE "MINING DEVELOPMENT ACT, 1902-1924," AND FROM THE MINING DEVELOPMENT VOTE.

The Assistant State Mining Engineer and District Inspectors of Mines did a great deal of field work in connection with assistance sought for the development and equipment of mines. Appendix No. 1 contains some of the more interesting reports of the Assistant State Mining Engineer.

Advances to aid developmental work and equipment of mines during 1929 amounted to £3,586 3s. 8d. Diamond drill boring was assisted to the extent of £13,015 10s. 1d. as follows:—

	£	s.	d.
Eradu	1,613	13	2
Cue (Big Bell Mine) ..	1,501	8	11
Cue (Little Bell Mine) ..	500	0	0
Carbine	784	16	0
Leonora	338	17	11
Mt. Magnet	*Nil*		
Norseman	1,918	11	6
Riverina	530	14	1
Bamboo Creek	3,052	8	2
Lalla Rookh	1,775	0	4
Braeside	1,000	0	0
Total ..	£13,015	10	1

Boring operations were also subsidised to the extent of £1,375 7s. 3d. by a Federal grant, all of it being spent at Greenbushes with the exception of £1 12s. 7d.

The mining interests concerned at Big Bell, Little Bell, Leonora and Braeside mines contributed

£1,667 7s. 10d towards the cost of boring operations, which amount was additional to the foregoing figures.

Providing transport and equipment to prospectors through the Central Mining Board cost £8,417 14s. 6d.; cartage subsidies paid to prospectors on ore treated at State batteries amounted to £6,892 3s. 1d.; rebates on State battery crushing charges, £1,220 14s. 9d.; water supplies, £2,418 18s. 2d.; subsidies paid towards the reduction of cost of water supplied to mines at Kalgoorlie and Meekatharra, £47,336 17s. 6d.; and miscellaneous expenditure £1,937 13s. 4d. The total expenditure was £84,825 15s. 2d.

Refunds of advances amounted to £2,131 10s. 5d.; miscellaneous refunds, £147 11s. 8d.; proceeds from the sale of securities, £1,773 6s. 10d.; total refunds, £4,052 8s. 11d.

Advances written off during the year amounted to £4,810 17s. 7d. (Appendix No. 11.)

ADVANCES ON ORES.

The only transaction during the year was the sale of a parcel of silver lead ore, 6 tons 11 cwt. 2 qrs. 3 lbs., which after smelting and assay charges had been deducted, realised £73 1s. 4d.

BORING.

The total amount of boring completed during the year was 12,110 feet, compared with 12,804 feet during 1928, as follows:—

I.	For Coal—Eradu	1,127	feet
II.	For Gold—Cue (Big Bell) ..	2,454	„
	Cue (Little Bell) ..	1,054	„
	Carbine	633	„
	Leonora	354	„
	Mt. Magnet ..	287	„
	Norseman ..	1,619	„
	Riverina	470	„
	Bamboo Creek—		
	Bonnie Doon Mine	340	„
	Kitchener ..	982	„
	Mt. Prophecy ..	475	„
	Lalla Rookh ..	799	„
III.	For Lead—Braeside	566	„
IV.	For Tin—Greenbushes ..	950	„
		12,110	„

A calyx drill was used to bore for coal at Eradu, and diamond drills were used at the other centres.

I.—WITH CALYX DRILL FOR COAL AT ERADU.

Continuing the report in the Annual Report for 1928, the Calyx drill again became available for our use at Eradu during May, and No. 6 Bore was commenced on 14th May at a point 20 chains W.S.W. from No. 1 Bore. It was completed on 4th June at a depth of 255 feet. A seam of coal was cut at 167 feet and extended down to 175 feet, and a second seam occurred between 180 feet 6 inches and 182 feet 9 inches. No. 7 Bore was commenced on 21st June at a point 55 chains S. 15 degrees E. from No. 6 Bore, and was completed on the 2nd July at a depth of 177 feet. A narrow seam of coal and shale was intersected between 73 feet 4 inches and 75 feet 4 inches, the proximate analysis of which was—

	per cent.
Moisture	31.50
Volatile hydrocarbons and combined water	23.20
Fixed carbon	13.37
Ash	31.93
	100.00

No. 8 Bore was commenced on the 17th July at a point 40 chains S. 18 degrees W. from No. 1 Bore, and was stopped at a depth of 312 feet on 3rd September. A seam of coal 14 feet thick was cut between 172 feet and 186 feet, and another between 191 feet and 198 feet 6 inches.

Following are proximate analyses of four samples by Dr. E. S. Simpson, Government Mineralogist and Analyst:—

No. 1 Seam—

	per cent.
Moisture	23.30
Volatile hydrocarbons ..	25.08
Fixed carbon	21.44
Ash	30.18
	100.00

No. 2 Seam—

—	Top Section.	Middle Section.	Bottom Section.
	%	%	%
Moisture	22·21	22·93	15·21
Volatile Hydrocarbons...	22·11	24·14	21·79
Fixed Carbon	33·63	36·53	20·79
Ash	22·05	16·40	42·21
	100·00	100·00	100·00

No. 9 Bore was commenced at a point 118 chains S. 22 degrees E. from No. 6 Bore on the 16th September, and was stopped at a depth of 383 feet on the 16th October. No coal seam was revealed in the core, but carbonaceous shale with coal bands were found between depths of 64 feet and 84 feet. It seems quite likely that a fault exists more or less along the course of the river. The report of the Government Geologist in another division of this Annual Report of the Department of Mines deals fully with the data obtained from boring.

The boring done at Eradu with the Calyx drill has been as follows:—

	feet.
1926	832
1927	2,162
1928	1,168
1929	1,127
Total	5,289

Boring ceased on the 16th October until such time as funds can be provided for its continuance.

II.—WITH DIAMOND DRILLS ON THE GOLDFIELDS.

Cue (*Coodardie*).—Two boreholes had been completed at the Big Bell Mine, Coodardie, at the close of 1928, the particulars of which were recorded in the Annual Report for that year. No. 3 Bore was commenced on the 17th January at a point 270 feet south of the centre of the Main Shaft or 140 feet south of No. 2 Bore, and was depressed at an angle of 45 degrees on a bearing of 296 degrees. It was completed on the 4th February at a depth of 255 feet. The lode was entered at 111 feet, and continued to 219 feet. Particularly good values were obtained between 122 feet and 152 feet, which averaged 36.9 shillings per ton for 30 feet along the angle of the bore, representing a width of approximately 21 feet. The intersected hanging wall country of ferruginous biotite and white schist from 44 feet to 111 feet contained gold values varying between 1s. and 32s. per ton, with a general average value of about 10s. 9d. per ton.

No. 4 Bore was started on the 12th February at a point 275 feet north of the centre of the main shaft or 200 feet north of No. 1 Bore, and was depressed at an angle of 45 degrees also on a bearing of 296 degrees. It was completed at a depth of 250 feet on 1st March. The lode extended from 111 feet to 176 feet, or 65 feet along the angle of the bore and a reference to the petrological report shows that values persist in it at this northerly point.

No. 5 Bore was drilled at a point 37 feet south of No. 1 Bore and 235 feet from the eastern wall of the lode at the surface. It was commenced on 9th March, and was depressed at an angle of 60 degrees on a bearing of 296 degrees. The object of this bore was to cut the lode at a vertical depth of 500 feet. It was completed on 4th May at a depth of 690 feet. The lode was cut at 260 feet, and extended to 363 feet along the bore. All information available at this time relative to the dip of this lode indicated that it was practically vertical. Cutting a lode at 260 feet in the bore instead of at about 600 feet indicated that either the main lode had a dip of over 70 degrees or that a parallel lode which had not outcropped had been found. In order to test the ground thoroughly the bore was continued to a depth of 690 feet, a point considerably beyond a vertical line below the outcrop. As no lode was encountered at depth, the result showed that the lode instead of being vertical had a dip S.E. of 74½ degrees. Gold values were maintained in the core from this bore, and attention is directed to the petrological report appearing in Division IV. of this Annual Report of the Department of Mines. In view of the interesting information obtained from the five bores drilled it was decided to drill two more boreholes to cut the lode at 500 feet vertical depth under Nos. 1 and 3 Bores.

No. 6 Bore, depressed at an angle of 60 degrees, was commenced on the 17th May at a point 470 feet from the hanging wall of the lode outcrop, almost immediately behind Nos. 1 and 5 Bores, on a bearing of 297 degrees. It was completed on the 10th July at a depth of 617 feet, and the lode channel was intersected between 495 feet and 604 feet, the main lode extended from 495 feet to 586 feet carrying the usual average values.

No. 7 Bore was commenced on the 19th July at a point 430 feet from the hanging wall of the lode outcrop and 300 feet S.W. from No. 6 Bore. It was depressed at an angle of 60 degrees on a bearing of 291 degrees. It was completed on the 29th August at a depth of 642 feet, the lode having extended from 462 feet to 618 feet carrying typical values, as detailed in the petrological report.

The results obtained from the seven boreholes drilled at the Big Bell Mine were highly interesting and valuable. Mr. H. Mandelstam, for whom the boring was done on the £ for £ basis, decided to investigate No. 7 Bore, and arranged that Mr. E. H. B. Macartney, B.A., B.C.E., should survey it. Mr. Macartney found that this borehole had flattened considerably in its downward course. It was commenced at an angle of depression 60 degrees to the horizon at the surface and flattened to an angle of 37 degrees to the horizon at a depth of 520 feet in the bore and steepened a little to 39 degrees at a depth of 630 feet. This flattening caused the lode to be cut at a vertical depth of approximately 400 feet, and the drill passed through it into the footwall at a vertical depth of 450 feet. Had the drill not diverted from an angle of 60 degrees to the horizon the lode would have been entered at 500 feet vertical depth as intended and the hanging wall would have been met at 600 feet vertical depth. As is well known there is a tendency for a diamond drill to cut at right angles through the rock strata. The country rock on the hanging wall side of this lode dips very steeply towards the south-east. The bearing of the boreholes varied from 291 degrees to 297 degrees, so that in plan they intersected the country within a few degrees of right angles. But viewing the boreholes in cross-section, they intersected the strata at considerably less than a right angle, which inclined the drill to rise or flatten in an endeavour to cut them at right angles. It has been proved that the lode in Gold Mining Lease 2058 persists at depth over a length of 600 feet, and has a width of approximately 100 feet. It certainly continued south of No. 3 Bore, and will probably be found to continue right through G.M.L. 2057. Although its characteristics have diminished in Gold Mining Lease 2050 (Little Bell), it was cut at three points in that lease as indicated in the report of those bores. It is also quite reasonable to suppose that it continues on its northern strike north of No. 4 Bore, and there is sufficient evidence before us now to show that the lode is of great length and width. There is also ample justification for the belief that it will persist to a great depth. The average value of the gold contents for the full width of the lode in each borehole is remarkably consistent. It is not a high average value, but there are zones up to 30 feet in width having really good values. The ore is capable of being mined and treated for the extraction of gold on an exceedingly large scale, which would ensure low costs. Tests made at the School of Mines' Laboratory, Kalgoorlie, indicate that there are no metallurgical difficulties in treatment. The tests showed that—

1. No difficulty should be experienced in the treatment of this ore by cyanidation, and the consumption of cyanide and lime should be low.
2. The gold is extremely fine, and not directly associated with the sulphides.
3. Fine grinding is necessary to liberate the gold.
4. The amount of colloidal slime produced during fine grinding is so small and the rate of percolation of the comparatively fine sand product—65½ % minus 150 mesh—is so rapid that

grinding to minus 150 mesh and treatment of the whole product by percolation should present no difficulty, and would probably yield the best commercial extraction.

I might add that with modern power plant and machinery consisting of rockbreakers (if necessary), cone crushers, grinding mills, classifiers, thickeners and rotary filters, this ore could be successfully treated in large quantities at a surprisingly low cost per ton.

During the year 2,454 feet of drilling were done at Big Bell Mine, and 746 feet during 1928, a total of 3,200 feet.

Cue (*Little Bell Mine*).—Three boreholes were drilled at Gold Mining Lease 2050, known as the Little Bell Mine, Coodardie, which adjoins the Big Bell Mine on its southern boundary.

No. 1 Bore was started on the 11th September at a point 470 feet north of the southern lease boundary and 230 feet from the eastern boundary. It was depressed at a angle of 60 degrees bearing 276 degrees, and was stopped at a depth of 331 feet on the 23rd September.

Low grade gold values were obtained from the core between 201 feet and 213 feet, 218 feet and 227 feet. The formation between 289 feet and 331 feet was similar to the auriferous rock in the Big Bell Mine, but only contained traces of gold.

No. 2 Bore was started on the 30th September at a point 370 feet north-westerly from No. 1 Bore, and was depressed at an angle of 60 degrees bearing 274 degrees. It was completed on the 10th October at a depth of 316 feet. A large low grade formation was disclosed by the core from 190 feet to 300 feet with the best values from 207 feet to 229 feet. It is interesting and important that the gold values were contained in coarse-grained biotite quartz schist between 244 feet and 263 feet. It was found that gold was occasionally present in the biotite schist in the Big Bell Mine, mainly in the lode near the hanging wall, but the gold mostly occurred in the white granulated muscovite quartz schist.

No. 3 Bore was commenced on the 17th October at a point 135 feet in a north-westerly direction from No. 2 Bore and was depressed at an angle of 60 degrees bearing west. It was completed on the 2nd November at a depth of 407 feet. The lode channel is easily recognisable in the core between 368 feet and 392 feet, but the gold values are very low grade.

The petrological reports of the cores from these three bores show that the country rock in the Little Bell is lithologically similar to that in the Big Bell Mine.

Carbine.—At the Carbine Mine, situated about 35 miles north-west from Coolgardie in the Kunanalling district, a vertical bore was drilled in the hope of proving the downward continuation of the lode at 550 feet vertical depth, or approximately 200 feet on the underlay below the bottom level. The site was reported on by the Assistant State Mining Engineer in the 1928 Annual Report (page 45). The bore was started on the 13th March at a point 500 feet on a bearing of 82 degrees from the main shaft, and was completed on the 23rd May at a vertical depth of 633 feet. From 433 ft. 6in. to 438ft. and from 450ft. to 453ft. the core consisted of quartzose material and greenstone, and when assayed it proved to be without gold or silver values. The balance of the core contained no metallic mineralisation or other evidence of lode formation and the borehole was drilled at least 80 feet below the horizon at which it was expected to find the lode.

The drilling plant was transferred to Riverina during the month of June.

Leonora.—At the Harbour Lights Mine, No. 2 Bore, depressed at an angle of 60 degrees which had reached a depth of 180 feet at the close of 1928, was continued to a depth of 534 feet and stopped on the 4th February. From 267 feet to 426 feet traces of gold to 15s. per ton values persisted. Although a large ore deposit undoubtedly exists to a depth of seven hundred feet vertical in this mine, the gold values are too low grade to permit of it being worked profitably.

The drilling plant was sent to Carbine.

Mt. Magnet.—At page 65 of the 1926 Annuual Report will be found a report by the Assistant State Mining Engineer on locating boring sites in the Mt. Magnet district. Attached to this report will be found a plan showing the workings of the Mt. Zion Mine (late Sirdar) with two bore sites marked thereon.

On the 27th November drilling was commmenced with the plant which had been sent from Little Bell Mine, and at 31st December the depth of the bore was 287 feet. Details of these operations will be given in next year's Annual Report.

Riverina.—In last year's Annual Report appeared two reports by the Assistant State Mining Engineer (pages 45 to 48) on the Riverina Proprietary Mine. It was subsequently decided to drill two boreholes to intersect the downward continuation of the lode at a vertical depth of approximately 480 feet or 200 feet below the bottom level in the mine.

Appendix No. 1 attached to this report contains particulars of the sites chosen for the boreholes which are shown on the plans and section of the workings.

Considerable delay was experienced in transporting the drilling plant from Carbine on account of heavy rain and impassable roads. Drilling was commenced on the 17th July and proceeded satisfactorily to a depth of 141 feet, when difficult ground was encountered, causing drilling troubles which persisted for many weeks. At the close of the year a depth of 470 feet had been reached.

Reports on boring at Riverina will appear in the next Annual Report.

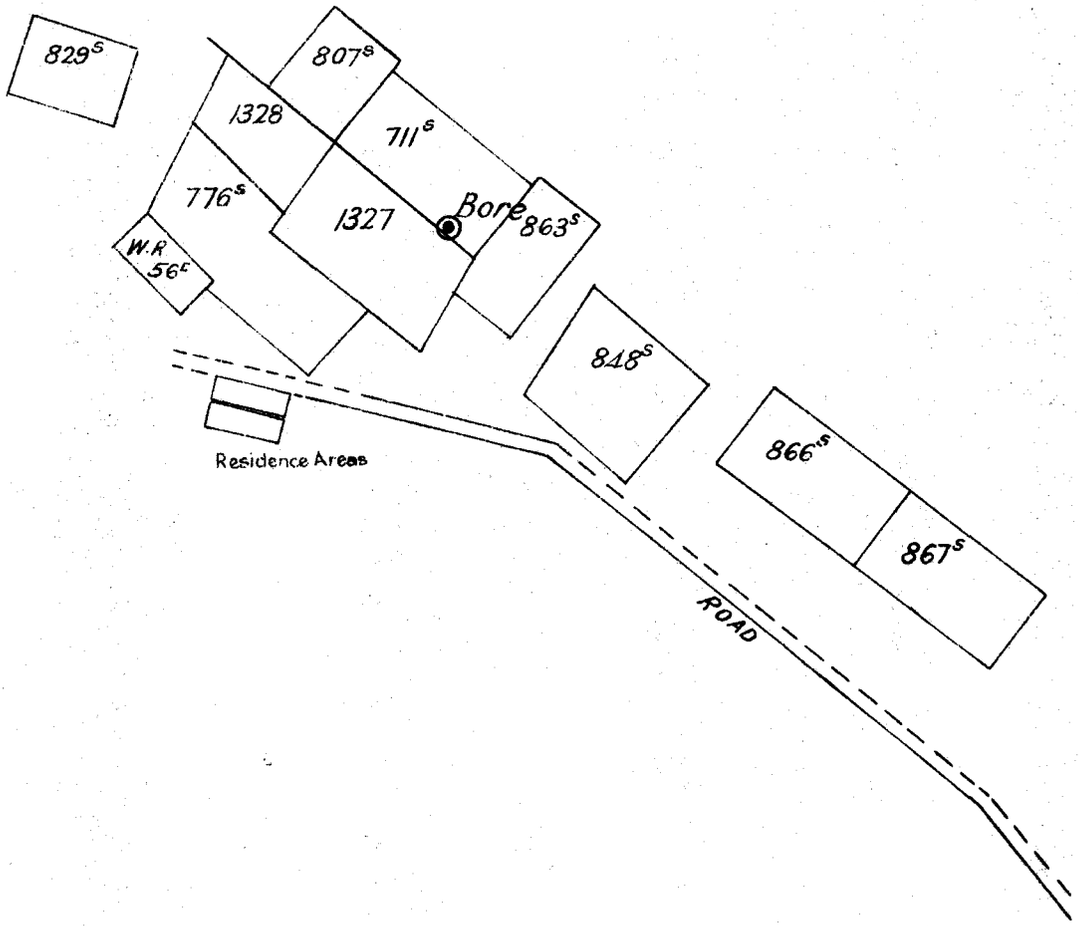
Norseman.—The selection of boring sites in the Norseman district received careful attention for some considerable time during the early part of the year. The north end of the district produced large quantities of gold, principally from the Princess Royal Mine, where the reef was developed somewhat extensively in that mine and the Princess Royal Central Mine to a depth of 1,000 feet, but payable gold values gave out at a little below 500 feet vertical depth. The southern end of the district also produced a large quantity of gold, one of the principal mines being the "Lady Mary." From the information at our disposal the most promising part of the district for boring operations is along the lines of lode situated in the central area of the district on the eastern side of the townsite. In that area two more or less parallel lines of lode occur, the more easterly contains the Mildura and Viking Mines, and on the westerly line the New and Old Mararoa Mines are

Locality Plan Shewing Bore

CARBINE

20 0 20 40

– Scale of Chains –



Locality Plan of Bores

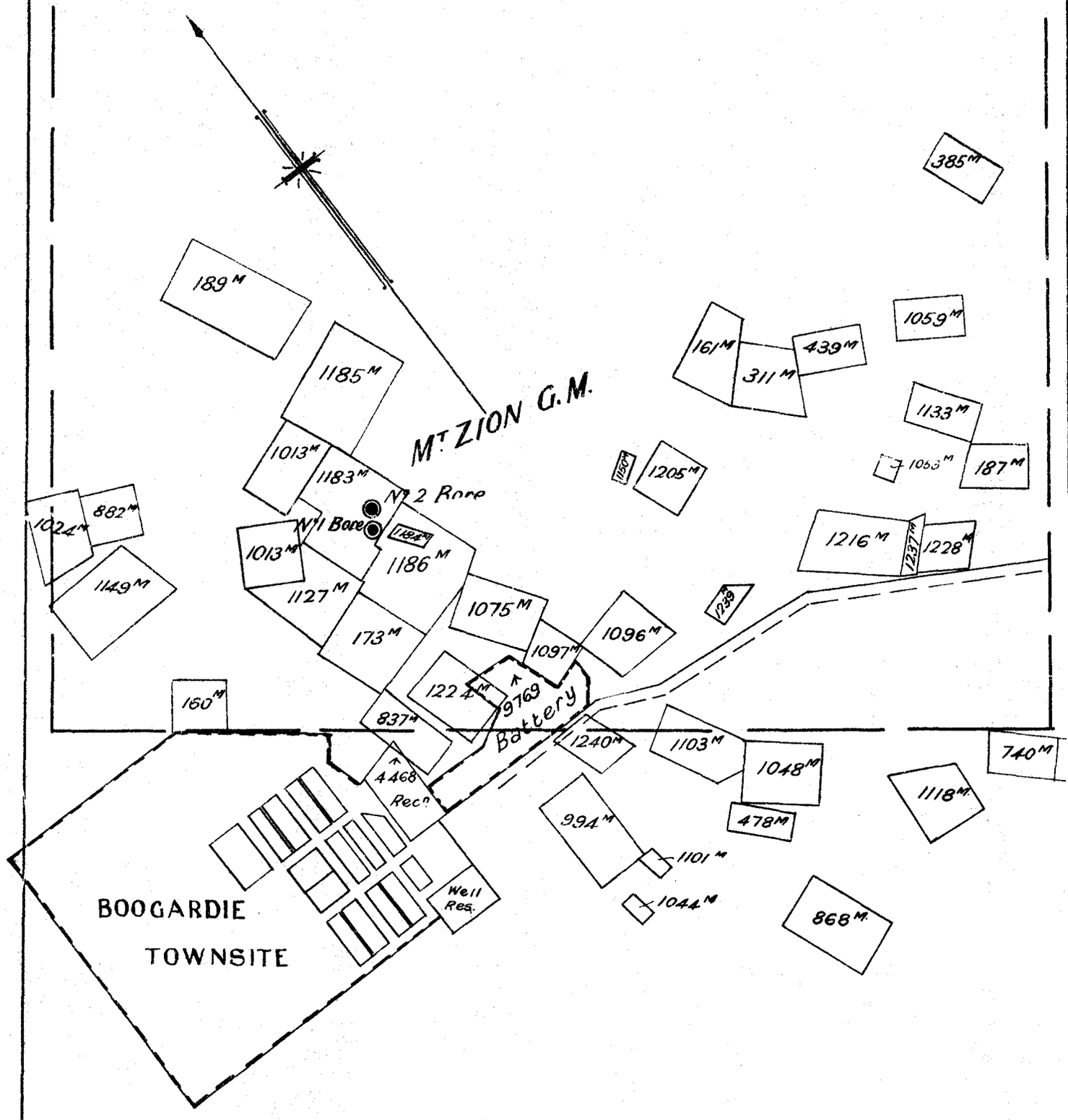
BOOGARDIE

20 0 20 40

—Scale of Chains—

546 H

Boring Reserve



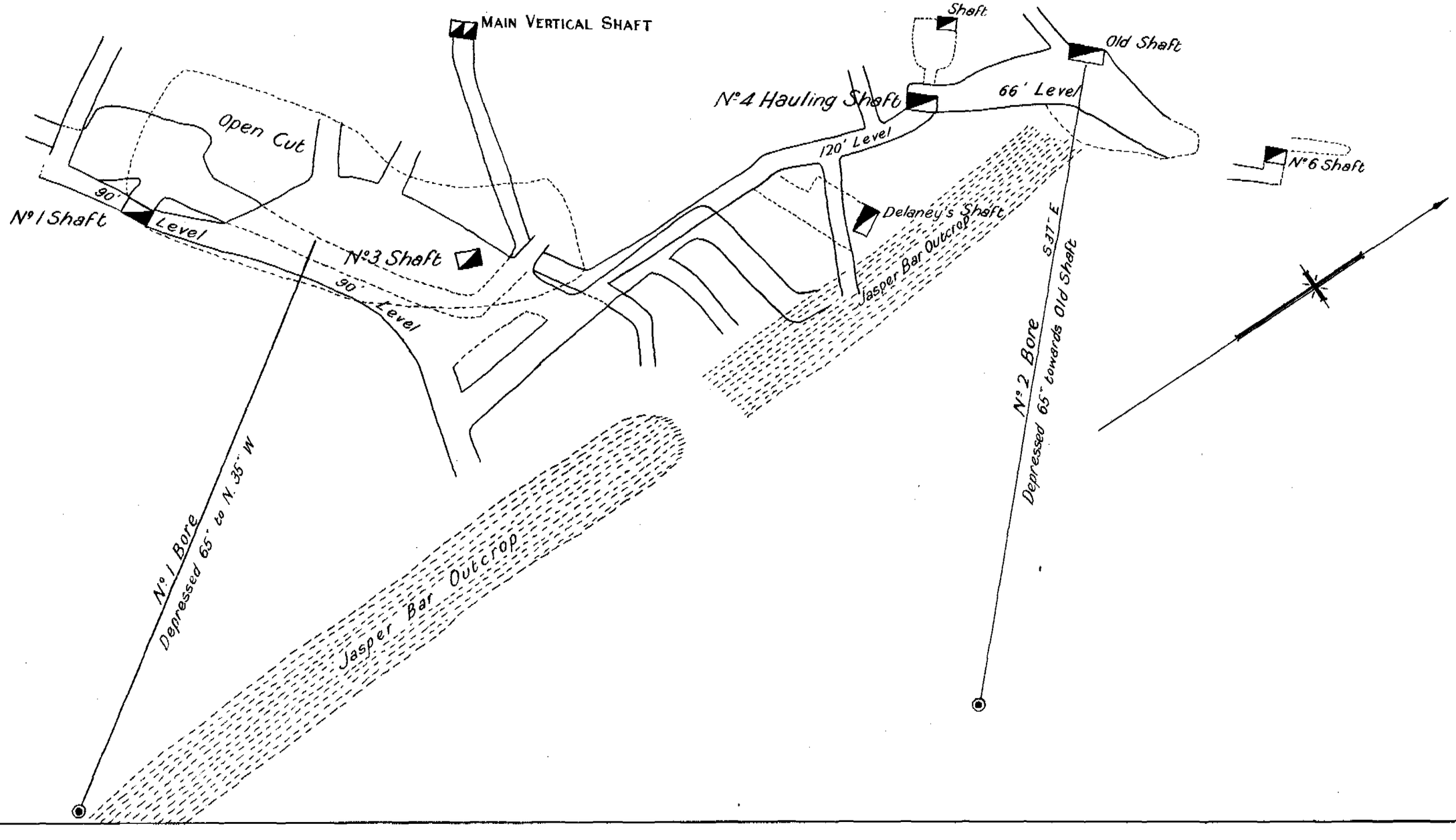
Plan Shewing Bores

Mt Zion G. M.

Boogardie

20 0 20 40 60

— Scale of Feet —



located. Appendix No. 1 contains a report by the Assistant State Mining Engineer relative to five sites selected for boring operations and which are shown on the locality plan.

No. 1 Bore was commenced on the 24th April on Crown lands adjoining Gold Mining Lease 1311 (Old Mararoa Mine) at a point 90 feet east of the lease boundary. It was drilled vertically in the hope of intersecting the lode at a depth of 640 feet or about 200 feet on the underlay below the intermediate level (402 feet) north drive off No. 2 Rise North. The bore was stopped at a depth of 700 feet on the 29th July. At 590 feet a strongly schisted channel was met and which continued to 675 feet. This channel contained the main quartz reef from 609 feet 8 inches to 621 feet 9 inches, a smaller reef from 647 feet to 650 feet, and a quartz vein from 671 feet to 672 feet 3 inches. From 609 feet 8 inches to 613 feet 8 inches traces of gold occurred. The core between 613 feet 8 inches and 616 feet 2 inches assayed 25s. per ton, 616 feet 2 inches to 618 feet 9 inches, 47s. per ton, 618 feet 9 inches to 620 feet, 36s. per ton, and 620 feet to 621 feet 9 inches, 17s. per ton. The reef dips at an angle of approximately 45 degrees and the length of lode core drilled vertically from 609 feet 8 inches to 621 feet 9 inches represents a width of reef of 102 inches. The average assay value of all the core was 21s. 6d. per ton, and 97 inches from the footwall representing a width of 70 inches averaged 32s. per ton. This was a very encouraging result and should lead to mining operations being undertaken at depth in this area.

No. 2 Bore was commenced on the 6th August on Gold Mining Lease 985 and was drilled vertically, in the hope of locating the reef at a point about 200 feet below the surface where it has not been explored by mining operations. It was stopped at 298 feet on the 27th August.

With the exception of 14 inches of quartz at 62 feet which assayed 26 grains of fine gold per ton, no distinctive quartz veins were cut. A strongly schisted channel was disclosed between 30 feet and 141 feet and a little schisted rock was cut between 194 feet 6 inches and 196 feet, but yielded no gold by assay.

No. 3 Bore was the first of three bores to be drilled on the southern end of the Viking line of lode. There are two sets of workings in the Viking Mine, and it has not been determined whether they are on the same lode or whether there are two lodes. The lode in the northern workings has a dip of approximately 43 degrees, whilst in the southern working the lode has a dip of 36 degrees. The two workings have not been connected at any of the levels. Bores Nos. 3, 4, and 5 when completed should throw some light on this matter. No. 3 Bore was commenced on the 4th September on Gold Mining Lease 1323, very close to the N.E. corner of G.M.L. 990, and was drilled vertically to test the lode at about 500 feet in the northern workings. It reached a depth of 545 feet on the 22nd November and was stopped. Quartz was cut at 181 feet 7 inches to 183 feet 7 inches and again at 525 feet 9 inches to 526 feet 3 inches, while siliceous lodestuff was found between 529 feet 10 inches and 531 feet. All this core was assayed, but it contained no gold.

No. 4 Bore was commenced on the 6th December, and had reached a depth of 76 feet at the close of the year. Its location is 5 chains south from No. 3 Bore inside the northern boundary of Gold Mining Lease 1321.

The total amount of drilling done at Norseman during the year was 1,619 feet.

Pilbara Goldfield.

Bamboo Creek District.

As pointed out by the Assistant State Mining Engineer in his report appearing in Appendix No. 1, this mining centre has produced high grade ore for many years, and our records show that 25,149 tons of ore yielded 41,093 fine ounces of gold and 817 ozs. of dolled gold. Mining operations have been confined to shallow depths, and it was deemed advisable to test some of the more important reefs below the present deepest workings. The mines selected for boring were the Bonnie Doon, Kitchener and Prophecy, all of which have good yield records.

Bonnie Doon Mine.—This old mine is situated immediately south of the State Battery, and provides water for that plant. The ore body which strikes east and west and dips north is a strong quartz reef up to 8 feet wide, and has been worked near the surface for a length of 220 feet and produced 4,060 tons for a yield of 3,654 fine ozs. gold by amalgamation plus tailings values not recorded.

A bore was commenced on the 2nd May, depressed at an angle of 60 degrees on a bearing south to cut the lode at a vertical depth of 270 feet. It was completed at a depth of 340 feet on the 27th May, but no indication of the lode was found in the bore.

Kitchener Mine.—Situated one mile south-east from the Bamboo Creek townsite, this mine adjoins the State Battery Reserve on the north side. The reef strikes north-west and south-east, and is practically vertical, and has been worked to a depth of 250 feet, the south-eastern end being more defined with better values than the north-western end.

No. 1 Bore was started on the 15th March to cut the reef at a vertical depth of 400 feet at a point about 120 feet south-east of the Main Shaft. It was depressed at an angle of 60 degrees, and when it reached a depth of 482 feet on the 11th April it was stopped. A lode consisting of carbonates and quartz was cut between 407 feet and 443 feet and again from 456 feet to 473 feet, but unfortunately the core did not contain gold values, although assayed from 328 feet to 482 feet. The lode in the higher levels consists of quartz and carbonates and has yielded very good values, although there are defined poor zones in it. It seems certain that, unfortunately, the drill cut the lode in one of the poor zones, but that happening should not discount the value of the mine in any way. The lode is strongly defined in the core, and there is no reason to doubt it will carry values as heretofore.

No. 2 Bore was depressed at an angle of 60 degrees and was commenced on the 21st March at the point indicated on the plan to cut the lode 65 feet north-west of the main shaft at a vertical depth of 400 feet. These workings have not been so extensive as the southerly workings, and it was thought advisable to drill at this site. When the bore reached a depth of 500 feet it was stopped on the 25th April. None of the rock showed sufficient mineralisation to be regarded as lodestuff.

Mt. Prophecy Mine.—This mine adjoins the old townsite and is about one mile north-west from the State battery. For details see Appendix No. 1.

One bore was drilled depressed at an angle of 45 degrees to cut the lode 267 feet below the 180ft. level. It was anticipated that 376 feet of drilling would be required, but as no lode was cut at that depth it was continued to 475 feet without success. The work commenced on the 22nd April and was stopped on the 18th May. The core showed that the bore throughout its whole length was in one class of rock, *i.e.*, a spentinous talcose rock with carbonated modifications and carbonate veins were common. Apart from a powerfully carbonated zone between 354 feet to 360 feet, which contained no gold, no lodestuff was discovered.

Lalla Rookh.—This mine is situated about 30 miles north-west from Marble Bar and the workings are described in Appendix No. 1. In view of the fact that good values were going underfoot below the deepest workings in places, two boreholes were drilled, one to cut the north reef and the other the south reef at about 250 feet vertical depth.

No. 1 Bore, depressed at an angle of 45 degrees, was commenced on the 19th July to cut the south reef and was stopped on the 14th August at a depth of 405 feet. The core was assayed from 298 feet to 405 feet, but only traces of gold were found at 300, 350, and 380 feet, and no defined lode was found.

No. 2 Bore also depressed at an angle of 45 degrees, was commenced on the 18th July and was stopped at 394 feet on the 14th August. The core was assayed from 357 to 394 feet and gold to the value of 14s. 6d. per ton was found from 373 to 375 feet, all other samples showed that no gold was present.

The total boring done at Lalla Rookh was 799 feet.

III.—WITH DIAMOND DRILLS ON MINERAL FIELDS.

For Lead at Braeside.—At the beginning of the year six bores had been completed at Braeside, Nos. 1, 2, 3, 4, 5, and 9 and were reported on in last year's Annual Report.

No. 8 Bore was started on the 9th January on Mineral Lease 326, depressed at an angle of 55 degrees bearing 245 degrees. It was completed at an inclined depth of 350 feet on 5th February. From 305 feet to 320 feet the core consisted of an altered silicified basaltic rock, with much quartz and carbonates but carried no lead.

No. 10 Bore was commenced on the 16th January at the northern end of Mineral Lease 291, being the second bore on this lease, and was depressed at an angle of 68 degrees at a point 280 yards north of the shaft and bearing 70 degrees. It was finished at 209 feet in depth on 13th February. Galena occurred between the inclined depths of 92ft. 8in. and 100ft., representing a width of lode of 31 inches. The mineral from the core assayed from 36.55 per cent. to 56.47 per cent. lead, 3.5 per cent. to 6.07 per cent. zinc, and 20.45 dwts. to 30dwts. per ton silver.

During February a notification was received to the effect that the mining interests, providing two-thirds of the cost of boring operations, had decided not to complete the original programme of ten bores, and consequently Nos. 6 and 7 Bores were not drilled. No. 6 Bore had been commenced and had reached a depth of seven feet when operations ceased.

During the year 566 feet of boring were done at Braeside, 2,568 feet during 1928, a total of 3,134 feet. The results were disappointing with the exception of the lode intersected in No. 10 Bore. Some of the bores were drilled under boldly outcropping lodes, but no lodes were intersected at depth. At Mineral Lease 291, No. 9 Bore was drilled under an outcropping lode of galena, but the core did not reveal a definite lode, although specks of galena were visible in greenstone at 336 feet.

No. 10 Bore, which was drilled north of No. 9 at a point where no lode outcropped, intersected a lode 31 inches wide containing high lead values at a depth of 93 feet. These results indicate that the lodes may probably be lenticular. The nature of their occurrence could best be proved by mining operations.

For Tin at Greenbushes.—During 1928 eight bores were drilled at Greenbushes, representing a total of 2,433 feet of drilling. The programme was completed early in 1929, when three boreholes had been drilled at the Kapanga Mine.

No. 9 Bore was commenced on 16th January at a point 575 feet north-west from the south-west corner peg of the lease. It was depressed at an angle of 45 degrees bearing east. It was completed on 1st February at a depth of 300 feet, but the lode was not intersected, although the depth of the bore was a good deal in excess of that required to do so had the lode continued down.

No. 10 Bore was commenced on 8th February at a point 660 feet north of the south-east boundary peg. It was depressed at an angle of 45 degrees bearing west and was therefore bored from the eastern side of the lode. It was completed at a depth of 300 feet on the 28th February, but the lode was not intersected.

No. 11 Bore, started at a point 200 feet north from No. 10 Bore and depressed at an angle of 45 degrees, was drilled at the request of the mine owner and with the concurrence of this Department on a bearing of 225 degrees instead of 270 degrees as originally intended. The object of drilling this hole in a south-west direction was to intersect a lode stated to have a strike N.W.-S.E. in addition to the main lode striking north. It was commenced on the 8th March and completed on the 27th March at a depth of 350 feet, but neither lode was intersected.

In view of the fact that Bores Nos. 9, 10, and 11 failed to intersect the lode, it was decided not to drill No. 12 borehole. During the year 950 feet of boring were done on the lease at Greenbushes, a total of 3,383 feet drilled at various mines in the district.

The result of all these operations was disappointing. In most cases lodes were intersected at various depths but little or no tin was contained in the cores.

The diamond drilling plant was transferred to Norseman in April.

MINING.

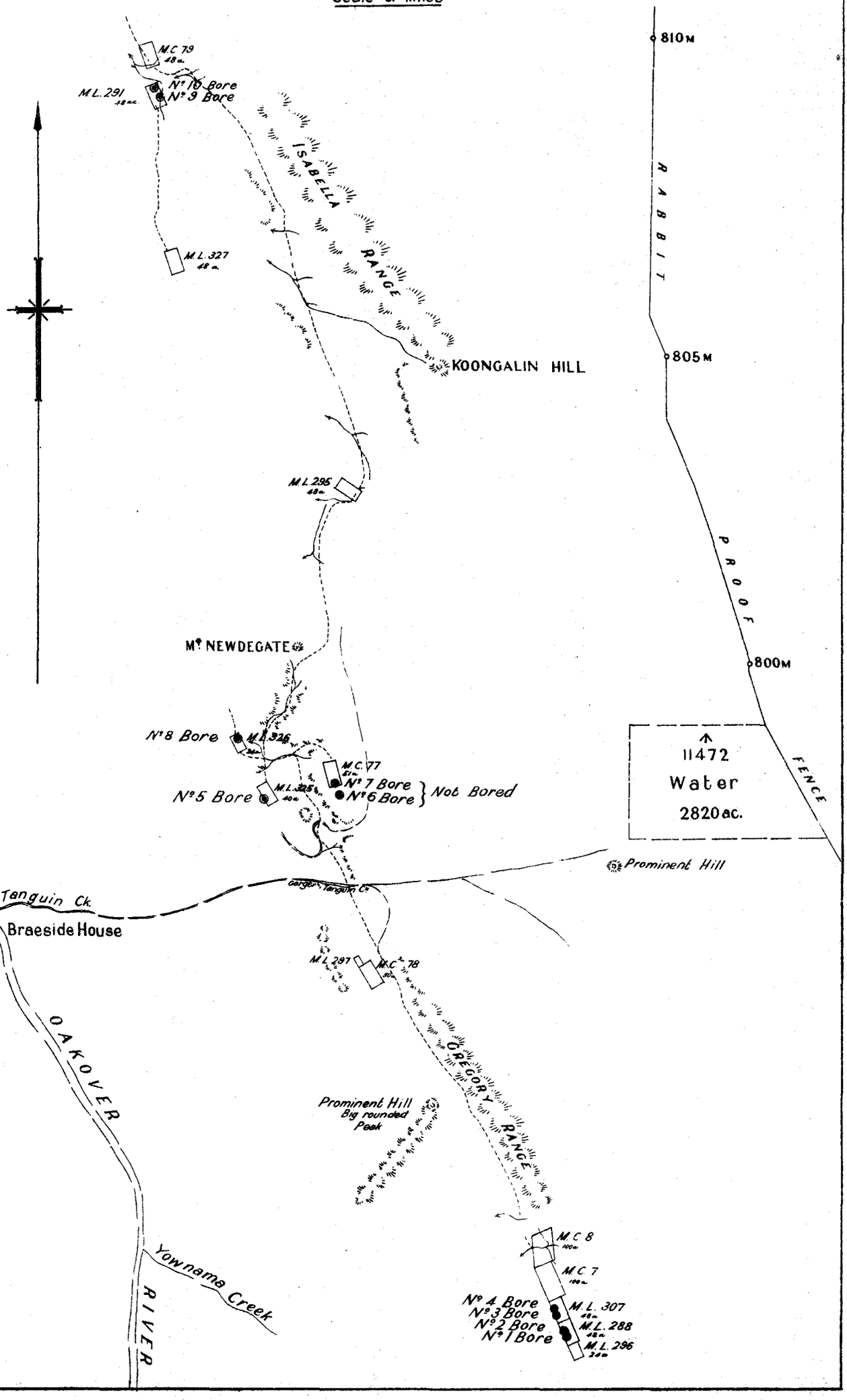
Kalgoorlie Mines.

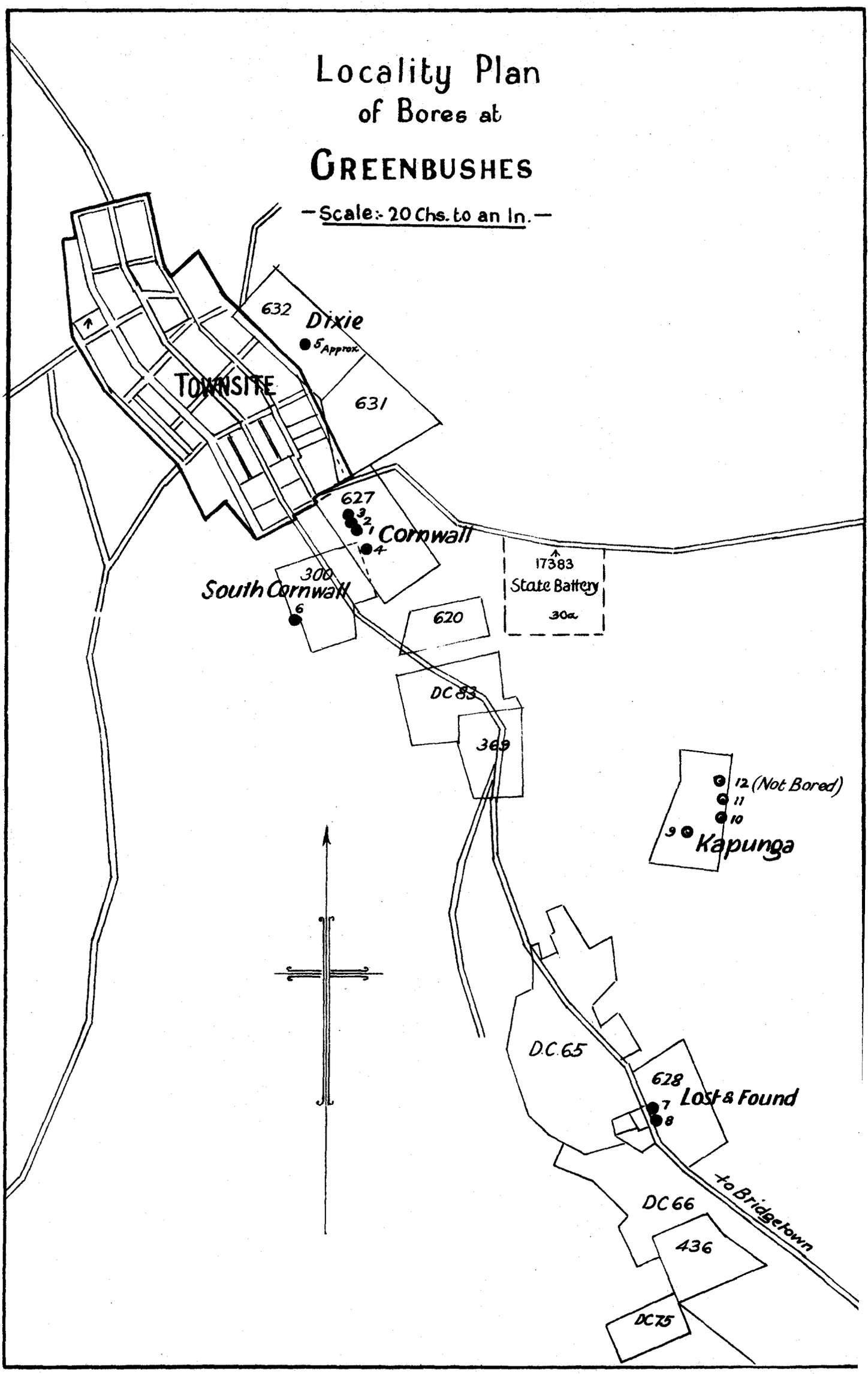
The development work done in the mines on the Boulder Belt indicates a hopeful augury for the future. The Lake View and Star acquired the Golden Horseshoe Mine, which in addition to

Plan Shewing Bores at BRAESIDE

2 1 0 2 4

— Scale of Miles —




Locality Plan
of Bores at
GREENBUSHES
—Scale:- 20 Chs. to an In.—
632
Dixie
5 Approx.
TOWNSITE
631
627
3
2
1
Cornwall
4
308
South Cornwall
6
620
17383
State Battery
30a
DC 83
369
12 (Not Bored)
11
10
9
Kapunga
D.C. 65
628
7
8
Lost & Found
to Bridgetown
DC 66
436
DC 75

Chaffers, Hannans Star, Ivanhoe, and Lake View Leases comprises on important group of mines. A particularly active programme of underground development work has been undertaken, with a view to the extraction and treatment of a much larger tonnage of ore than heretofore and a general reduction in costs. Other mines have also steadily pursued underground development policies and during the year nearly 20,000 feet of development work were done in ten leases, *i.e.,* driving 9,893 feet, crosscutting 3,351 feet, winzing 2,579 feet, rising 168 feet, shaft sinking 253 feet, diamond drilling 3,518 feet. An increased production in future can be anticipated with confidence. It must be recognised, however, that large programmes of developmental work underground and on surface cannot be completed in a short time, and that many months will be required to bring them to completion.

Wet Treatment of Kalgoorlie Ores.

It cannot be too strongly stressed that a less costly process for the treatment of ore won from the Kalgoorlie mines than the dry crushing and roasting process is impertative in the interests of the future prosperity of the industry in that centre. This matter was pointed out by the Royal Commission of 1925 and later by the Technical Committee appointed by the Development and Migration Commission. The dry crushing and roasting process has given good results insofar as recovery is concerned, but it has proved very costly.

Many improvements have been made in recent years relative to wet crushing and grinding machinery. A large number of treatment plants in Australia and elsewhere are wet crushing and grinding ones to grades of minus 150 mesh and minus 200 mesh at low costs. Kalgoorlie ores do not present any difficulties whatever relative to wet crushing and grinding, which could be done in quantity and at the present cost of power for 5s. per ton. The subsequent treatment of the finely ground ore is a matter which has engaged the attention of mine officials for some considerable time. The problem to be solved is the recovery of the gold contents of the ore by a wet process. Sufficient experimental work has now been done to indicate that at least two treatment processes for the recovery of gold have excellent chances of succeeding by yielding recoveries equal to that obtained from the dry treatment process. By whatever process of treatment the gold in these ores is recovered, fine grinding is necessary on account of its intimate association with sulphide-telluride mineral.

Large tonnages of ore have been treated in the past by bromo-cyanide processes which were never thoroughly successful, and which at the present time are not used. The failure to obtain satisfactory ex-extraction of gold was no doubt in a great measure due (a) to the machinery used being incapable of producing a sufficiently fine grade to ensure dissolution of the gold; and (b) to the application of bromo to pulp improperly prepared for its reception. Experimental work carried out during the past two years by the Boulder Perseverance, Ltd., and some of it on quite a large scale, has given results which indicate that a satisfactory recovery of the gold contents can be made with the bromo-cyanide process. It has hitherto been thought that although bromo-cyanide dissolved the gold in telluride, it failed to dissolve it satisfactorily when associated with the pyritic minerals. It is claimed that difficulties in that regard have been overcome and the Company has decided, with Government assistance, to construct a 250-ton a day unit to test the process in a substantial manner. The layout will include modern crushing and grinding machinery, accessories and equipment, and the Company is to be highly commended for its policy to establish an all wet treatment process in the near future.

The Lake View and Star, Ltd., has also recognised the necessity for cheaper treatment and after a great deal of investigation and experimental work, a plant has been designed to grind the ore wet, recover the gold-bearing mineral by flotation concentration and to treat the concentrates by roasting followed by cyanidation. A unit to treat 150 tons of ore a day has been ordered and is expected to be in operation during the coming winter It will be replete with modern appliances and will provide a welcome advance in metallurgical practice at Kalgoorlie. The Company is to be congratulated upon undertaking the installation as a practical and well directed attempt to lower costs substantially.

The success of these plants will give renewed life to the mines. If both processes are successful, it will remain for the companies operating on the field to adopt the one which gives the better economic result. Both plants will use very similar means of producing pulp of fine grade. If one treatment process is found to be more successful than the other, the treatment section of the less successful plant could be modified to adopt the better process.

I wish to state that the officers in charge of the departmental Research Laboratory, School of Mines, Kalgoorlie, have carried out much valuable work relative to wet treatment of Kalgoorlie ores and which has been acknowledged to have been of substantial use and importance to all concerned.

Wiluna Gold Mines, Wiluna.

The development and equipment programme of the Wiluna Gold Mines progressed most satisfactorily during the year, the railway from Meekatharra having been sufficiently completed in December to transport material to the mine. The main shaft has been sunk and completed to a depth of 600 feet. This shaft will have a capacity of 60,000 tons of ore a month when hoisting from a depth of 1,500 feet with electrically operated winders. Haulage levels have been driven at 290 feet and 450 feet and storage battery locomotives will transport the trains of ore from stopes to the shaft. The ventilation of the workings is receiving close attention and high capacity blowers are being installed.

The power plant will consist of seven 540 H.P. crude oil engines to drive electric generators and also three oil driven high speed compressors. The aggregate horse-power will be 5,000. The site for the plant has been prepared and the machinery is in course of construction. Well equipped workshops are nearing completion. A treatment plant to crush and grind the ore to a fine grade, concentrate the gold bearing mineral by flotation, and recover the gold values by roasting the concentrate and subsequent treatment with cyanide solution by modern methods is also in course of construction. A housing scheme for employees has also been partly completed. Some months will elapse before the treatment of ore can be commenced.

Sons of Gwalia, Ltd., Gwalia.

The programme of underground development outlined in my Annual Report for 1929 was pursued with the utmost vigour during the period under review.

The agreement under which Government assistance is being granted provides for a total advance of £78,000, of which £40,000 is allocated to underground development and £38,000 to machinery equipment.

Development.—The period of time for the expenditure of £40,000 allocated for this work was spread over three years, *i.e.*, £19,000 for the first year, £14,000 for the second year, and £7,000 for the third year. During the year, it was agreed to allow the expenditure to be incurred more quickly with the result that the work was pushed on and advances amounting to £22,632 18s. 5d. were paid. In two years £37,613 3s. 2d. were advanced, leaving an unexpended balance of £2,386 16s. 10d. at 1st January, 1930. Recently £2,000 was used to pay interest and instalments and £386 16s. 10d. was paid to the Company for work done during January. The £40,000 allocated to development have, therefore, been advanced. It has also been agreed to advance the Company £6,270 for development work during the months of February to June from the money allocated to machinery equipment.

During 1929 the work done with Government assistance was 59 feet of shaft sinking, 1,013 feet of driving, 785 feet of crosscutting, 1,018 feet of winzing, 171 feet of rising, a total of 3,046 feet. Additional to this footage, the Company did 2,164 feet of development, the cost of which was charged against working expenses. Sinking the main shaft had, unfortunately, to be suspended in August, at a depth of 4,051 feet on the incline until such time as operations at the south ends of levels 21 to 25, where ore can be more quickly made available for the mill, are completed.

At the close of the year the position of the mine had considerably improved and although the mullock scheme to the 24 level had not quite been completed (a pressing need to enable the stopes above the 25 level to be filled and worked as fills, where air currents can be controlled and temperatures lowered to below 76 degrees wet bulb, instead of continuing the pillar system in use for so long), it has since been brought to completion. It is anticipated that the ore in these stopes will become available for stoping again by the end of April, thus relieving the difficulty of tonnage to keep the mill fully supplied.

Machinery.—To complete the installation of three waste heat boilers, an advance of £1,340 was made during the year. The total amount of advances for machinery equipment has been £17,506 2s. 3d. The waste heat boilers have shown a satisfactory saving in firewood during the period of operation.

General.—During 1929, 118,328 tons of ore were extracted and treated, and 43,512 tons of old tailing were retreated. During the present year some very interesting and valuable features relative to underground developments have been revealed. It is hoped that when they are fully developed the ore reserves will be greatly enhanced.

Gnow's Nest Mine, Yalgoo Goldfield.

The main north drive No. 4 level was extended with Government assistance from a point 229 feet from the crosscut for a distance of 123 feet or total distance of 352 feet. At 288 feet from the crosscut quartz was met in the face and gradually improved in width and value. At 317 feet it was 36 inches wide and contained payable values. From 317 feet to 343 feet it had values of 70s. over an average width of 42 inches, but at 343 feet the lens petered out. The drive was continued in schist to 352 feet, and at 352 feet a borehole west was drilled and cut a new lens of ore assaying 48s. When the hole was fired out the lens was found to be 24 inches wide. From the position of this lens of ore it may safely be assumed that it is the downward continuation of the lens of ore worked near the surface in the early days of the mine.

During the time the foregoing development work was being done the mill was treating ore from the main lode stopes above No. 5 level. At No. 1 level (80 feet), the ore was stoped for a length of 240 feet. At No. 2 level (183 feet) the stoping length was reduced to 160 feet; at No. 3 level (283 feet) it was 150 feet; at No. 4 level (354 feet) it contracted to 130 feet, but at No. 5 level (445 feet) the shoot lengthened and was stoped over a length of 220 feet. At the end of February all pay ore above No. 5 level had been completely stoped out, and as the company's funds were exhausted, the mine was closed down in March. All tools and equipment except pump column and truck rails were removed. The flooding of the workings will probably damage the workings above No. 3 level.

The total output from the mine has been 37,101 tons for a yield of gold amounting to 25,865 fine ozs.

Various Mines.

The Mt. Prophecy Mine, Bamboo Creek, Pilbara Goldfield, is situated on the ridge of a steep hill and the lode has the usual north-westerly strike of the district and underlays north-east at an angle of about 65 degrees from the horizon. It has the lenticular habit and appears to have averaged between 24 and 36 inches in width. The lode has been worked at shallow depths over a length of 700 feet, and has produced nearly 8,000 tons of ore for a return of just under 2ozs. of bullion per ton and the tailing assayed 10dwts. per ton. Additional particulars relative to this mine appear in Appendix No. 1.

A loan of £683 12s. 6d. was advanced to the owner early in the year for the installation of a portable rock drilling plant. The use of jack hammers has enabled much speedier work to be done in the hard country rock than was possible with hand labour. The drilling plant has given great satisfaction and will, it is hoped, be the means of placing the mine in a sound position in the near future.

The Gladsome-Sand Queen Mine at Comet Vale was closed down during the year, but during that period negotiations to raise capital to re-open it were successfully undertaken. Since the close of the year 1929 the mine has been worked and should reach the stage of production in the near future.

The Riverina Proprietary Mine at Riverina was closed down throughout the year, but a programme of diamond drilling was commenced as indicated under notes on "Boring" in this report.

The Viking Mine at Norseman was prospected during the year but regular mining operations were not undertaken. Diamond drilling (reported on

elsewhere in this report) was commenced during the month of September.

The Waterloo Mine at Holden's Find was inspected by Mr. G. Lindesay Clarke, B.Sc., M.M.E., early in the year, but unfortunately money could not be raised to develop or work the mine in accordance with his recommendations. The Company went into liquidation and the mine is now idle.

Geophysical Prospecting.

The Imperial Geophysical Experimental Survey undertook to carry out some electrical prospecting in the Northampton district and completed field work before the end of the year. In accordance with arrangement the Mines Department has since done certain costeaning, shaft sinking, and crosscutting to explore their work, but we are informed that no report can be issued for some time yet.

LEAD AZIDE DETONATORS.

Lead Azide Detonators were first introduced into the Kalgoorlie Mines and elsewhere in this State towards the end of 1927 and by June, 1928, were in general use. Prior to these dates, the composite detonator was used from 1916, and before 1916, the straight fulminate detonator was used. During the years 1918 to 1928 inclusive, a period of eleven years, eleven accidents were caused by premature detonator explosions in the Kalgoorlie Mines and most of them happened either through detonators being carelessly dropped in various places and subsequently exploded by being accidentally struck with shovels or other tools. During 1929 six accidents were recorded in the same district, and in every case serious injury resulted to fingers and hands. One accident was found to be the result of the explosion of a composite detonator, which had been bent and the injured man was trying to straighten it, when the explosion occurred, obviously a wrong and dangerous thing to attempt. Another accident occurred as the result of a man doing something contrary to the provisions of the Mines Regulation Act, i.e., climbing a ladder with a rod in his hand; he slipped and grasped an iron ladder rung with the hand that held the rod, with the result that the detonator exploded and seriously damaged his hand. Three accidents occurred as a result of (so it was stated by injured persons, there being no witnesses), tapping saw-dust filling out of detonators, and one accident occurred while a fuse was being capped. In not one of these four accidents can the cause of the explosion be proved. It is difficult to obtain evidence in such cases, the injured persons having been alone at the moment and it is not possible to interview them until after their injuries have been treated and they have recovered from shock. Inspections of the places where accidents have happened have not revealed any helpful evidence. Responsible officers have made searching inquiries into the causes of these detonator accidents with negative results.

No other detonator accidents have been reported from any other mining centre in the State. Information was requested from all other States in the Commonwealth of Australia, New Zealand, India, Canada and South Africa, relative to the use of Lead Azide detonators. Replies from the several Australian States show that Lead Azide detonators have been in use for over two years, having been introduced during 1927, and in that period many millions have been used with complete satisfaction and a marked freedom from accidents. The following table shows the number of (a) fulminate composite and (b) Lead Azide detonators imported into Australasia during the years 1927, 1928, and 1929:—

Year.	Fulminate Composite.	Lead Azide.	Total.
1927	13,910,000	900,000	14,810,000
1928	4,505,000	6,260,000	10,765,000
1929	3,420,000	11,670,000	15,090,000
	21,835,000	18,830,000	40,665,000

These figures indicate very clearly the popularity of Lead Azide detonators. During 1927, the year they were introduced, only six per cent. of the total importations of detonators were Lead Azide. During 1928, the percentage increased to 53 and during 1929, no less than 77 per cent. of the total were Lead Azide.

The following very interesting extracts are taken from the Presidential address delivered by Dr. Wm. Cullen, LL.D., at the 39th Session of the Institution of Mining and Metallurgy (London) on the 17th October, 1929:—

Until recently the fulminate detonator with its copper tube held the field, as indeed it still does in America, but the Lead Azide detonator is rapidly taking its place, not only in this country but throughout the Empire and Europe. The fulminate detonator has had a run of over 60 years—it was never patented. Its one failing was its tendency to absorb moisture, with consequent decrease in strength. Indeed, this drops off considerably with extremely small percentages of moisture.

The Lead Azide detonator marketed at the present time has an aluminium tube and the charge is made up in two parts. The bottom portion of the charge, generally known as the main charge, consists of tetryl (trinitro phenyl-methyl-nitramine), and the top or priming charge of a mixture of lead azide and lead styphnate (lead trinitro-resorcinate), with a small percentage of aluminium powder. It is only necessary to add that the azide styphnate detonator is now a well-established article of commerce, and in South Africa, for instance, it has nearly replaced the old type.

The azide detonator has two distinct advantages over the old fulminate detonator. First, it is much stronger as regards its initiating or boosting power, and secondly, it can withstand the action of moisture much better. For example, Lead Azide detonators have been stored for three years in a water-saturated atmosphere, and at the end were as effective as immediately after manufacture. This does not mean that it is wise to relax the care taken formerly in the storing of fulminate detonators. In fact, too much attention cannot be given to ensuring good storage conditions. One further point should be mentioned in regard to azide detonators. Owing to the extra heat generated through the oxidation of the aluminium tube, their use is prohibited in certain classes of coal mines both in this country and elsewhere.

In proposing a vote of thanks for the address, Mr. C. B. Brodigan said:—

Much had been done for the benefit of mining engineers during recent years in the way of explosives, especially the invention of azide detonators, tending towards greater safety in the mines of the Rand—with which he was acquainted. Many accidents formerly were deliberate, the detonator was said to have dropped, and the workmen got compensation, but it became a different proposition when a 25-lb. hammer had to be dropped on the detonator to ensure its detonation. Accidents had shown a great diminution since the use of the fulminate detonator was discontinued.

The following are interesting extracts from reports recently received from responsible departments in Australia:—

South Australia.— . . . . . no case in this State of premature explosion from lead azide detonators by tapping out sawdust.

Victoria.—I have reviewed the records of accidents during recent years with detonators in this State and cannot find any evidence to suggest too sensitive a composition as being the cause of a premature explosion.

Tasmania.—Lead azide detonators have been used in this State practically from their introduction about three years ago. There has been no explosion caused by handling them or placing them on the fuse.

New South Wales.—Regarding safety in handling lead azide detonators, we have no record of any accident since their introduction that could be attributed to friction or percussion. Rather has our experience shown us that there is a very marked superiority over the other types in this respect. One instance brought this fact very forcibly before our notice. About 800 lead azide detonators were stolen by children from a licensed store. Many were recovered mutilated and mishandled in every conceivable way, and not one detonator exploded. It is difficult then to imagine how the tapping out of sawdust could have caused an explosion, and we would suggest that some other factor was a contributory cause to such explosions.

Queeensland.—. . . . . There have not been any complaints that lead azide detonators are not as safe to handle as detonators of the composite and fulminate types.

Sufficient time has not yet elapsed to permit of replies being received from abroad. The information received from kindred Departments in Australia,, however, indicates that Lead Azide detonators are perfectly safe when handled with ordinary care. A spark from a candle, pipe, cigarette, or match, falling into a detonator would most likely cause it to explode. Whatever the cause of the detonator explosion accidents in the Kalgoorlie mines may be, I feel certain it is not traceable to faulty material or manufacture. If such were the case, premature explosions must have been recorded in other mining centres in the State and throughout Australia, New Zealand, Canada, South Africa and elsewhere.

A. M. HOWE,
State Mining Engineer.

APPENDIX No. 1.

Sundry Reports by Mr. P. C. Wilson, B.Sc., B.E., Assistant State Mining Engineer.

These are excerpts from reports on the various mines to which reference is made, which have been examined in connection with applications for loan assistance under the Mining Development Act. The portions published are such as give information relative to the mines which may be of public interest:—

1.—DIAMOND DRILLING IN THE PILBARA GOLDFIELD.

(22nd April, 1929.)

I am submitting herewith particulars of the proposed boring sites in the above-mentioned district:—

Bamboo Creek.

This mining centre has for over thirty years produced consistently high grade ore. Our official figures show that 25,149.20 tons of ore have been treated yielding 41,093.04 fine ounces of gold, or an average value of a little over 32 dwts. per ton, in addition to which 817.60 ounces of gold have been obtained from dollied ore. Mining operations have, however, been confined to comparatively shallow depths, and it seems to me to be advisable to test some of the more important reefs below the level of the present workings. The mines selected are the Kitchener, the Prophecy, and the Bonnie Doon, all of which have good records. Brief details concerning these mines are as follows:—

The Kitchener G.M.L. 707: This mine is situated one mile south-east of the Bamboo Creek townsite and adjoins the State Battery Reserve on the north side.

The ore body is a quartz reef which is practically vertical and strikes north-west and south-east. The country rock is a hornblende schist.

I am indebted to Mr. H. Jackson, one of the present owners, for the following information regarding the distribution of values:—

100*ft. Level*: In the south-east drive, comparatively low values only were met with. Good grade ore, was, however, stoped out underfoot for a length of perhaps 60 feet. In the north-west drive the reef was 30 inches in width, worth 6 ounces per ton for the first 33 feet. From 33 feet to 73 feet values were low. For the remaining 30 feet also the reef was poor at the level, but underfoot it widened out to 5 feet. Two crushings averaged 31 dwts. per ton and 50 dwts. per ton respectively.

150*ft. Level*: The south-east drive was driven 160 feet on the reef, which was 30 inches in width. Values ranged from 29 dwts. to 69 dwts. per ton. In the north-west drive, for the first 80 feet, the reef varied from 6 inches to 60 inches in width and was worth from 55 dwts. to 60 dwts. per ton in value. From 80 feet to 115 feet the drive was in fault material. From this point to 140 feet the reef averaged 50 dwts. per ton for a width of 24 inches.

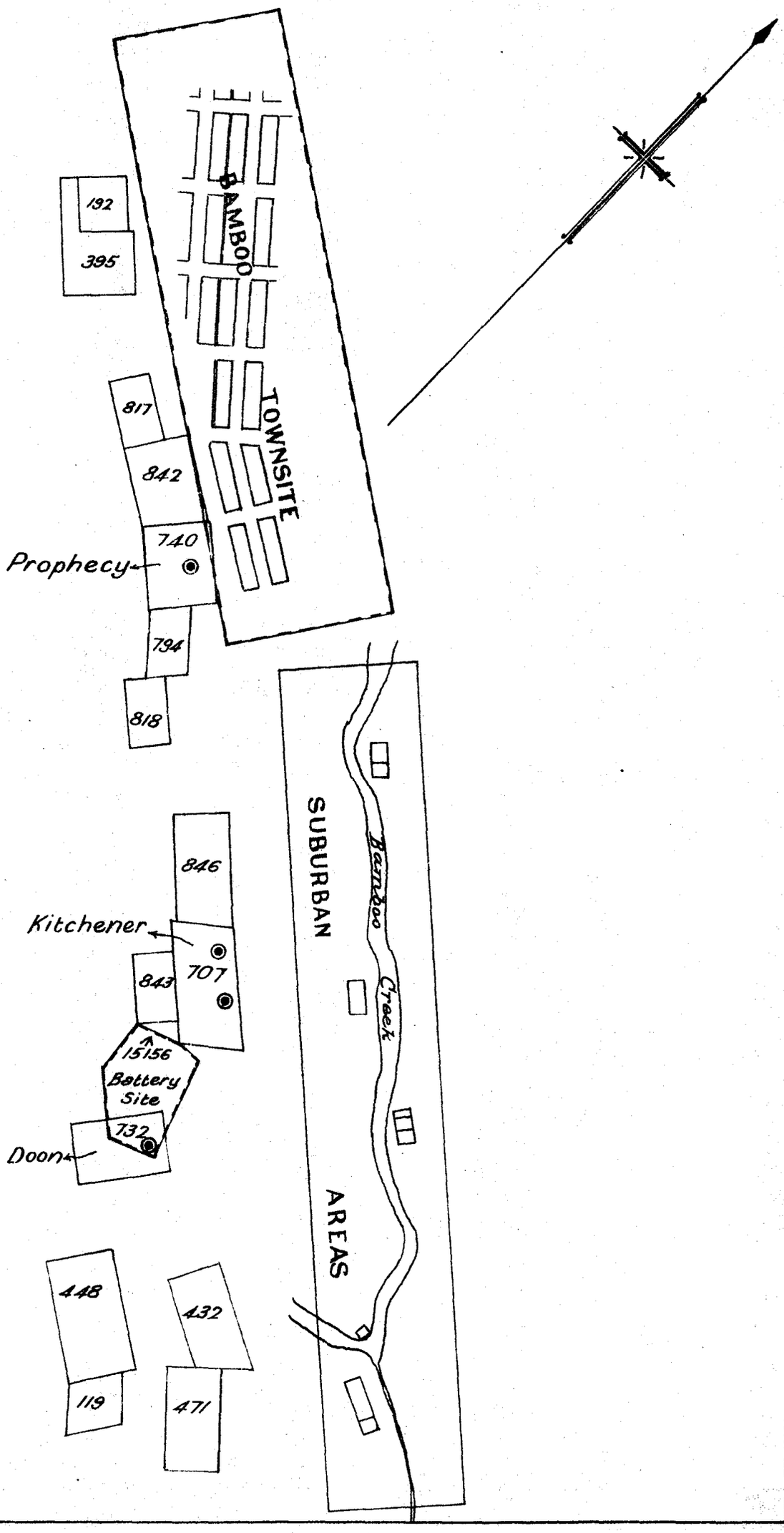
200*ft. Level*: The south-east drive was in poor ore which, however, was good both above and below this level. In the north-west drive I understand that little success was met with at the level itself, but above the level the reef was from 2 feet to 5 feet in width, and of good grade. The last crushing of 224 tons of ore yielded 424 ounces of gold.

Locality Plan of Bores

BAMBOO CREEK

20 0 20 40

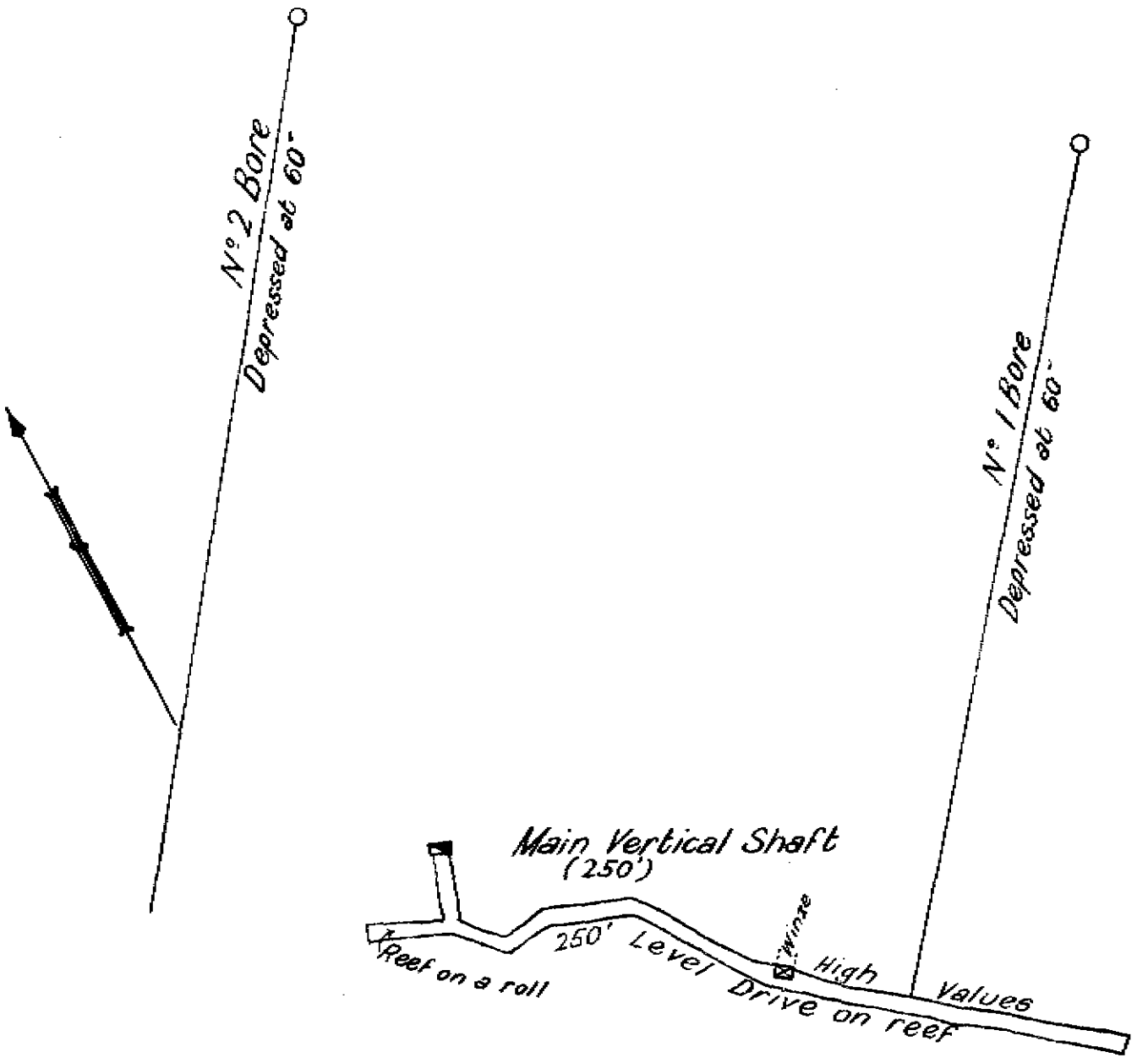
– Scale of Chains –



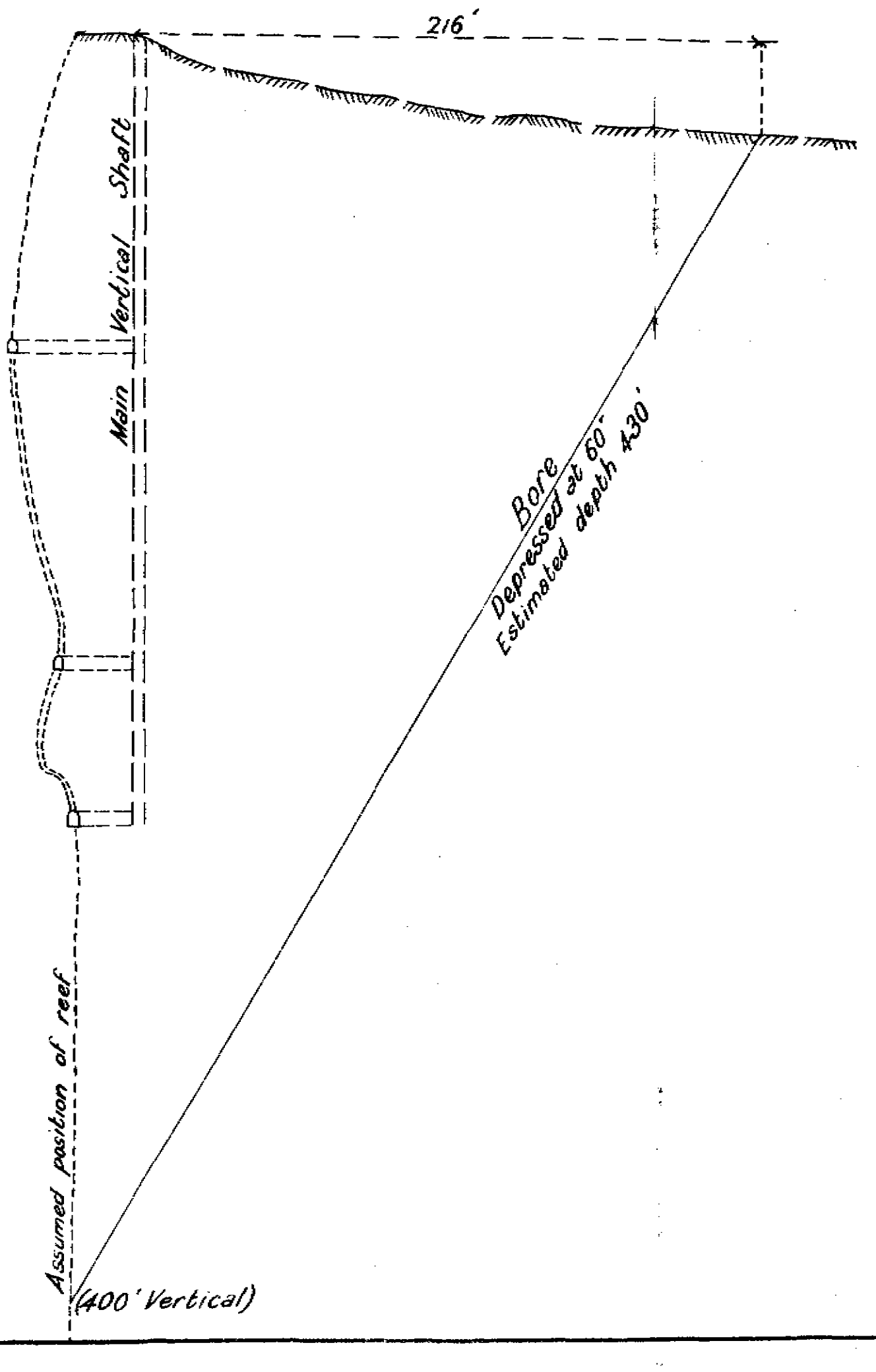
PLAN OF

KITCHENER GOLD MINE

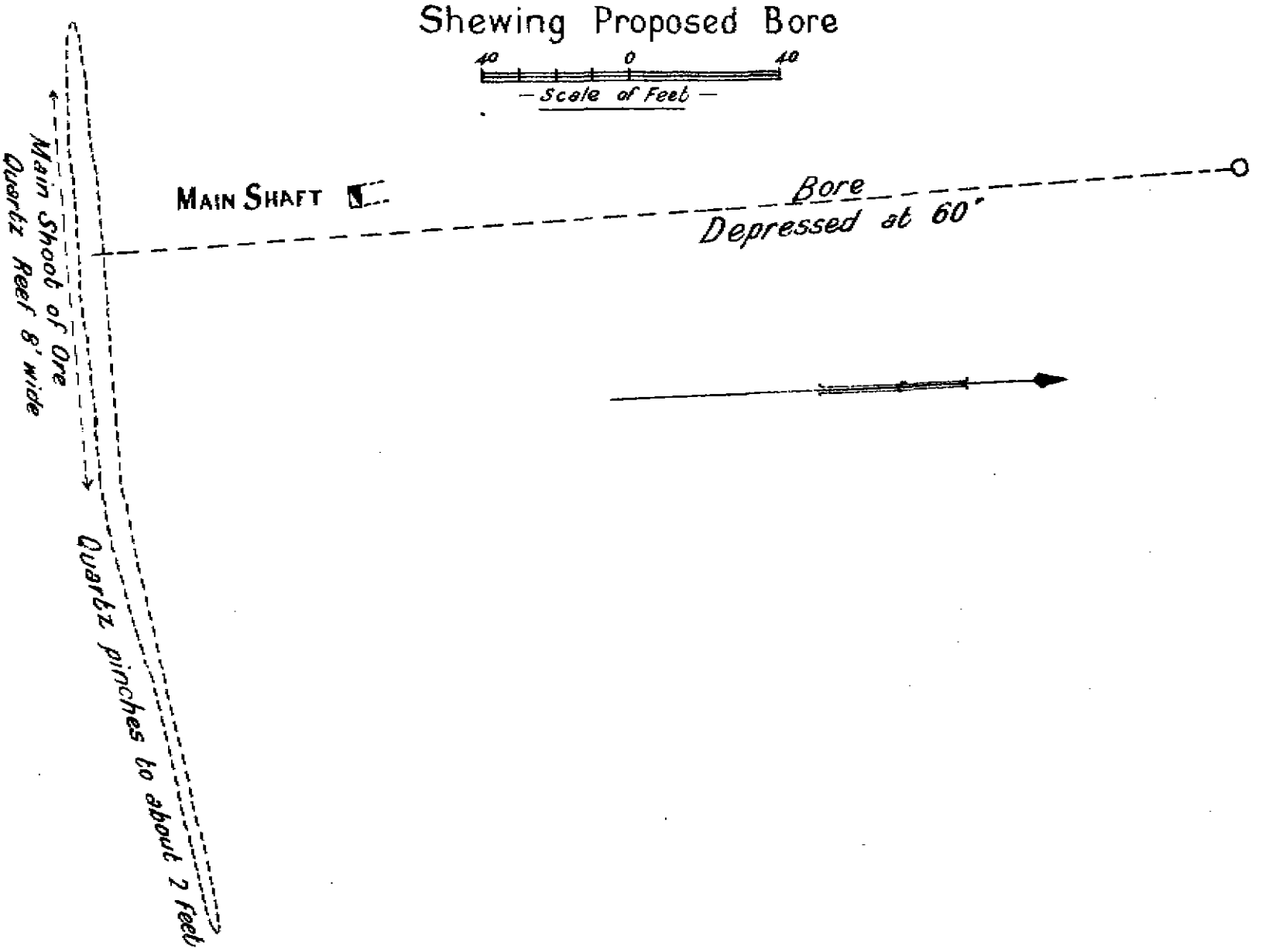
Shewing position of proposed bores

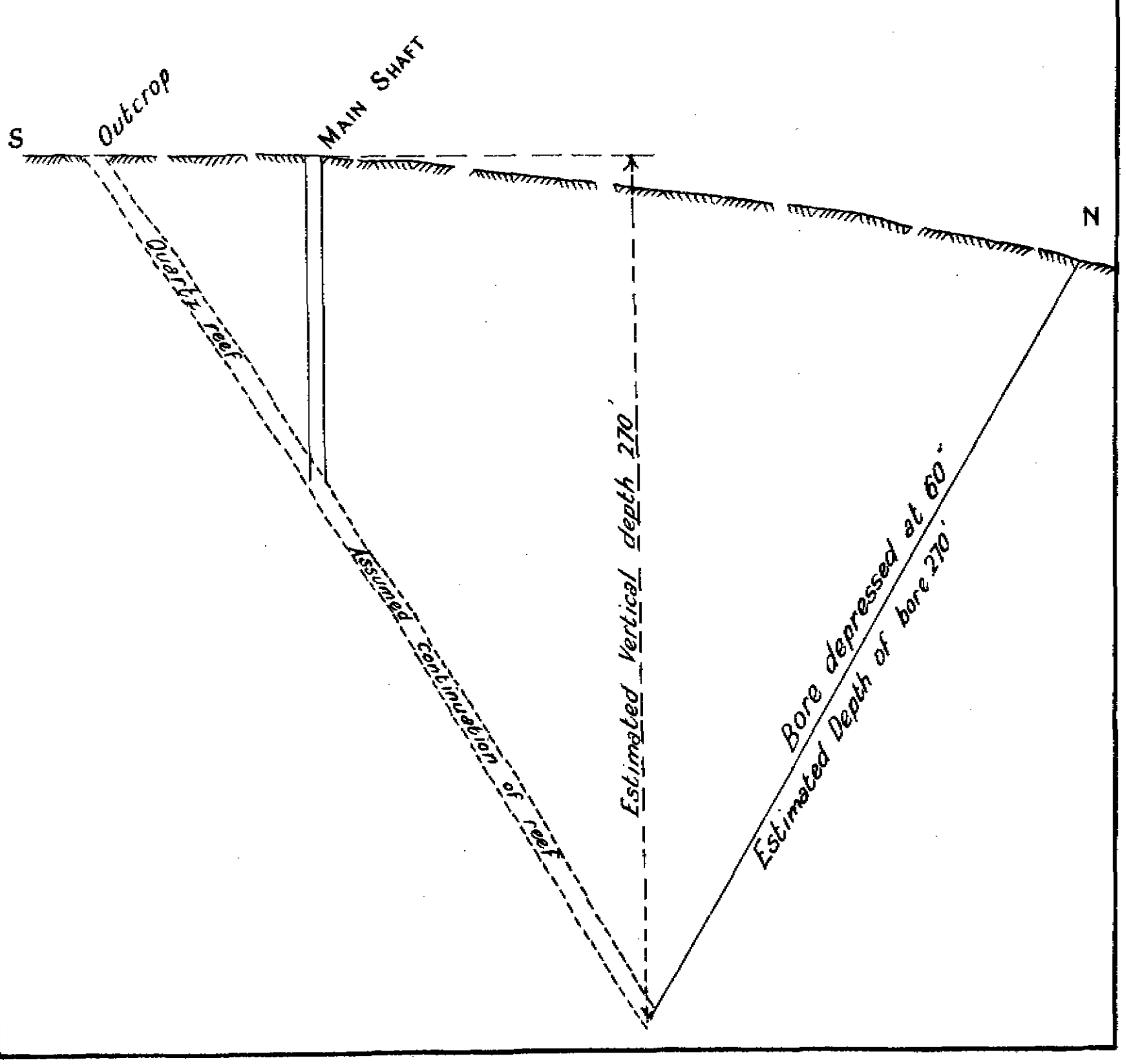


CROSS SECTION AT Nº 1 BOREHOLE



Plan and Cross Section
BONNIE DOON GOLD MINE
Shewing Proposed Bore



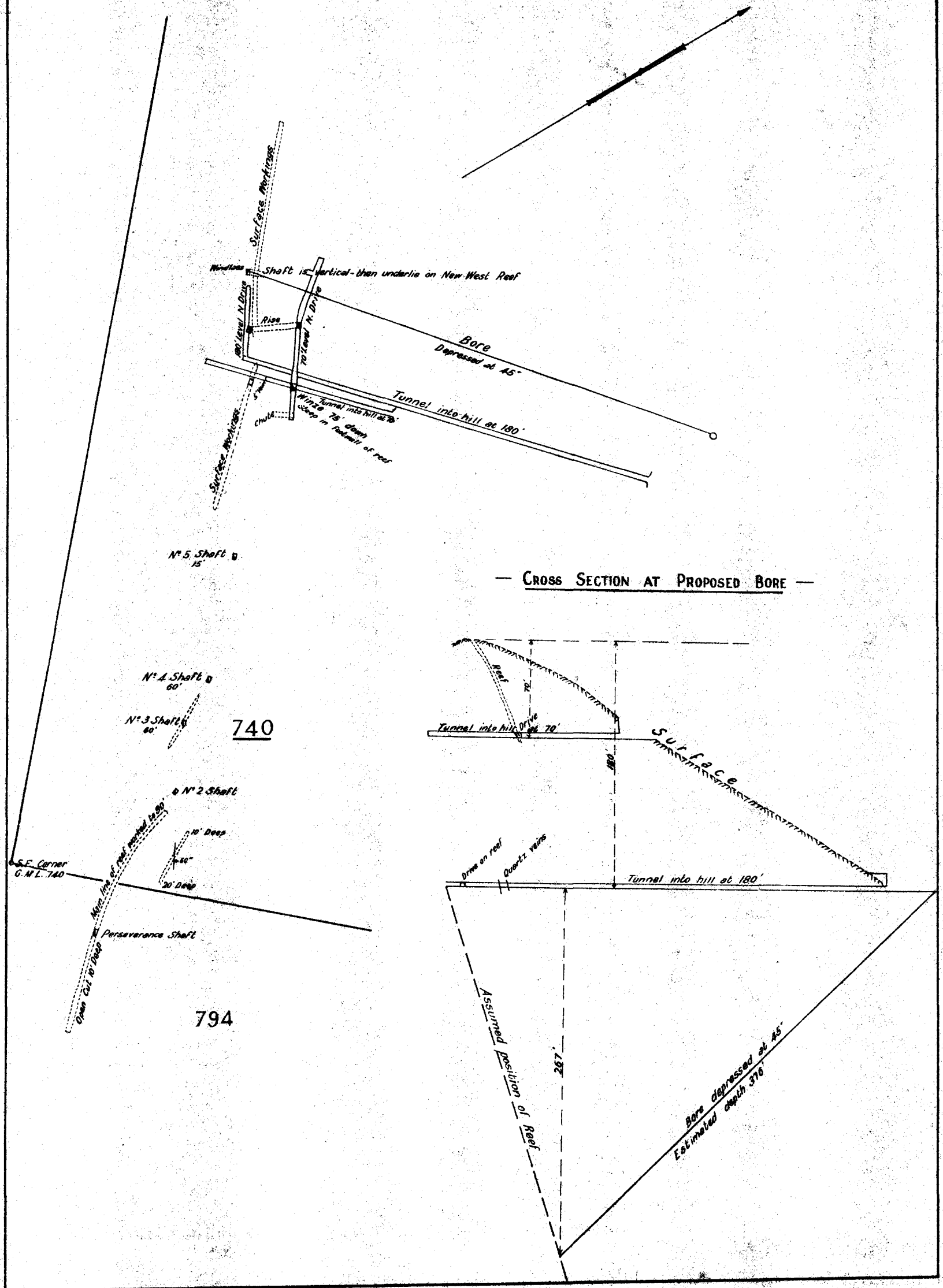


Plan of

PROPHECY G. M. L.

40 0 40 80

— Scale of Feet —



— Cross Section at Proposed Bore —

At the 250*ft. Level* the south-east drive has been driven 175 feet. Except for a local pinch about 60 or 70 feet along the drive the reef is from 24 inches to 30 inches in width and is stated to range from 25 dwts. to 50 dwts. per ton in value. The north-west drive has been driven 20 feet. Results were considered unpromising in this direction and the drive was stopped.

Production—Kitchener G.M.: From 1912 to 1927 this mine has produced 4,353 tons of ore yielding 8,492.55 fine ounces of gold, or an average value of 1 oz. 19 dwts. 11grs. per ton.

Recommendation: I recommend that two boreholes be put down on this property as follows.—

No. 1 *Bore* to be depressed at an angle of 60 degrees and to be laid out as shown in the accompanying plan to cut the reef at a point 120 feet south-east of the main shaft and at a vertical depth of approximately 400 feet. Estimated depth of bore 430 feet.

No. 2 *Bore* to be depressed at an angle of 60 degrees and to be laid out to cut the reef at a point 65 feet north-west of the main shaft and at a vertical depth of approximately 400 feet. Estimated depth of bore 430 feet.

The Bonnie Doon G.M.L. 732.

This mine is situated just south of the State Battery, which it provides with a water supply. The ore body is a strong quartz reef which has been worked near the surface for a length of 220 feet. Its strike is east and west and its inclination to the north at an angle of about 60 degrees from the horizontal. At the west end the reef is approximately 8 feet in width for a length of 100 feet. It tapers going east down to about 2 feet. The bottom of the mine is under water and cannot be inspected.

This mine is described in Geological Bulletin No. 40, by Mr. A. Gibb Maitland, as follows:—

Bonnie Doon G.M.L. 408.—The reef upon the property has an average strike of north-east with an underlay to the north at 60 degrees. This appears to be a cross line of reef to the main trend of those at present opened up on the district. A shaft had been put down on the reef to a depth of 82 feet, and a reef 6 feet in width met with. There is said to have been a considerable influx of water at the 82ft. level. The quartz of the Bonnie Doon contains a little iron pyrites, oxide of manganese, and a little talc. (B). When examined by Mr. Inspector Gladstone the reef then exposed was 10 feet in width. (G). The crushing returns from this property are included with those from the other leases held by the Pilbara Goldfields Company, viz.:—G.M.Ls. 62, 76, 406, 408, 471, which renders it impossible to give the yields from each individual property. The following table, however, shows the yield of gold, so far as it can be ascertained from the data supplied to the Government. (B):—

Year.	Ore Crushed.	Gold therefrom.	Rate per ton.
	tons.	ozs.	ozs.
Previous to 1897	829·00	1,948·00	2·35
1898	1,270·00	1,098·20	·86
1899	122·00	77·65	·63
1900	76·75	53·00	·69
Total ...	2,297·75	3,176·85	1·81

It is further described in Geological Bulletin No. 52, by Mr. T. Blatchford:—

Bonnie Doon G.M.L. 408.—As can be seen from the report of the Government Geologist for 1904, the ore body in this mine is much larger than the average quartz vein of the Bamboo District. The main shaft has at present a vertical depth of 100 feet, with two timbered compartments; a winze has been sunk 30 feet below this level. Stoping from the level upwards produced 1,000 tons of ore with a return of about £3 per ton over the plates. West of the shaft the quartz is intact and is from 4 to 8 feet thick. At present the workings are unsafe, but with a small capital outlay the stone could be cheaply mined. In the eastern end of the stope the stone is smaller but is considered payable. With anything like reasonable carting and crushing charges there are many hundred tons of ore above the 100 feet level in this mine which would give a handsome profit. I have every reason to believe that the reason why mining operations were stopped in this mine was due to the fact of the heavy crushing and carting charges, about 50s. per ton. The upper workings of the mine and gold returns have been referred to fully in the Government Geologist's report, 1904. While sinking the shaft the manager assured me that they drew from 5,000 to 7,000 gallons of water per hour. I have every reason to believe this statement.

Since the publication of Geological Bulletin No. 40 the production has been as follows:—

Year.	Alluvial.	Ore Treated.	Gold therefrom.
	Fine ozs.	ozs.	Fine ozs.
1912–1916 ...	73·2	944·75	683·59
1918–1919 ...	80·1	222·50	119·44
1919–1920 ...	80·7	190·00	80·21
	234·0	1,357·25	883·24

As this reef appears to be one of the strongest in the district, and apparently one of the most likely to live down, a borehole to test its value at depth seems justified.

Recommendation: I recommend that a borehole be put down at the site indicated on the plan and section attached to test the lode at a vertical depth of 270 feet, the bore to be depressed at an angle of 60 degrees from the horizontal. The site allows the reef to be tested at a convenient depth, and is also fairly well situated from a drilling point of view.

Mount Prophecy G.M.L. 740.

This mine adjoins the old Bamboo Townsite, and is roughly a mile north-west of the State Battery. The outcrop of the reef, which has produced the bulk of the ore won, is along the ridge of a steep hill, which is approximately 200 feet vertically above the road alongside it. This reef has the usual north-westerly strike of the district and underlays to the north-east at angle of about 65 degrees from the horizontal. It has the lenticular habit and would appear to have averaged between two and three feet in width between the 70ft. level and the surface. It has been worked at shallow depths over a length of 700 feet.

Mr. Gibb Maitland, in Geological Bulletin 40, published in 1908, writes as follows:—

Mount Prophecy G.M.L. 46 (late G.M.Ls. 46, 49).—This is a six-acre lease, originally held by a London company, the Mount Prophecy and Perseverance Gold Mines, Ltd., but which appears to have been abandoned many years ago. The reef appears to have been narrow

and irregular as followed down, although it was very wide in the outcrop, but despite this a good deal of work appears to have been done and over 4,000 tons of stone has been unearthed in both driving and stoping, all of which has been officially reported as returning over 2ozs. to the ton. (G.)

The reef outcrops near the summit of a ridge and a tunnel has been put in at about 75 feet below the outcrop; at 65 feet from the mouth the reef was met with, and was stoped up to the surface. The reef proved to be only 12 inches in width and very irregular. A winze was put down 75 feet from the end of this level upon a thin vein of quartz. A second tunnel had been put in at the base of the ridge at a point estimated to be 180 feet below the outcrop. It was anticipated intersecting the winze above mentioned at 280 feet. A 10-head mill was erected on a machine area close to the creek, about half a mile from the workings. (B.)

So far as may be judged by the official returns, the mine has had a good record, but owing to the state of the workings it was impossible for me to ascertain anything as to the nature and behaviour of the reef underground. The following table shows the yield of the property so far as has been officially reported:—

Year.	Ore Crushed.	Gold therefrom.	Rate per ton.
	tons.	ozs.	ozs.
Previous to 1897	925·50	2,350·00	2·54
1897	142·00	355·00	2·50
1898	272·00	728·50	2·67
1899	221·00	492·00	2·22
1900	97·50	147·10	1·50
Total ...	1,658·00	4,072·60	2·45

From 1913 to 1928, the Mount Prophecy produced in addition, 3,205.5 tons, yielding 5,015.50 ounces of fine gold, and the Perseverance G.M., which worked the southern portion of the same reef, 290.5 tons, yielding 584.21 ounces.

Reference to the plan accompanying this report, shows that tunnels were put into the hill to intersect the reef at 70 feet, and at 180ft. vertically below the outcrop. The results of driving at the 70 feet tunnel were disappointing, the reef being both small and poor. At the 180ft. tunnel, however, a strong body of quartz, about six feet in width, was met with 308 feet from the mouth of the tunnel. This appears to be a separate reef in the footwall of that worked near the surface. It was driven on for 51 feet and an underhand stope was taken out along it for a depth of 10 feet. The present owner, Mr. Watson, informs me that the ore from this stope was crushed separately and produced 81 tons of ore yielding 46.6 ounces of bullion, valued at £3 12s. 6d. per oz. The tailings were worth 5dwts. 5grs. per ton. This makes the total value of the ore to be 63s. 9d. per ton. He does not consider that ore of this grade can be profitably mined under existing conditions.

Summary and Recommendations.—The reef worked from the 70ft. level to the surface has been unusually rich, over 2oz. per ton. This reef appears to give out before the 180ft. level is reached, but another reef is met with further in the footwall, which is larger but not so high grade. It would be possible for this to be the same reef faulted. In any case, a reef six feet in width and worth 15dwts. per ton, is known to be going underfoot. A bore hole depressed at 45 degrees laid out to cut the reef 267 feet below the 180ft. level is recommended. This can be done by 376 feet of boring. (See attached plan.).

Lalla Rookh.

This mine is situated 30 miles west-north-west of Marble Bar, and 25 miles south-west of Gorge Creek, the nearest siding on the Port Hedland-Marble Bar railway.

The ore deposits consist of two parallel reefs, known as the North and South reefs, in addition to others of minor importance. These strike more or less east and west and are inclined steeply to the south. The north reef has been opened up to a depth of 140 feet. At the 90ft. level, it was stoped for a length of 250 feet. Comparatively little stoping has been done above the 140ft. level, where the ore won is stated to have been worth 75s. per ton. In width the reef ranged from 18 inches to about 60 inches. The south reef has been opened up to a depth of 150 feet. The reef in the main east drive at this depth was reported to have averaged 83s. 5d. per ton in value and 48 inches in width for the first 95 feet. For the remaining 10 feet, the drive was off the reef.

In the west drive at the 150ft. level, mine assays for the first 25ft. averaged 81s. per ton for a width of 36 inches, at which point the reef pinched very considerably. At about 80 feet, the reef swings round, and for the next 18 feet the drive is in a big body of quartz, apparently running north and south. Values here are erratic. Above the 60ft. level, the south reef was mined for a length of 400 feet.

Output of Mines.—The ore treated from 1900 to 1916 amounted to 6,908 tons, yielding 6,808.72 fine ounces of gold, or an average value of 19dwts. 17grs. per ton.

Summary and Recommendation.—In view of the fact that good values are going underfoot below the present workings in the case of both the north and the south reefs, I recommend that two boreholes be put down, one to cut the north reef and the other the south reef at a depth of 250 feet, as shown in the sketches attached.

The Barton G.M. 218*L.*

This mine is situated at Middle Creek, about 12 miles east of Nullagine, and is on a boldly defined line of reef, which outcrops for a length of over 1,200 feet. Our records show that it has been worked to a depth of 150 feet, at which depth 350 feet of driving were done from the main shaft in a south-westerly direction.

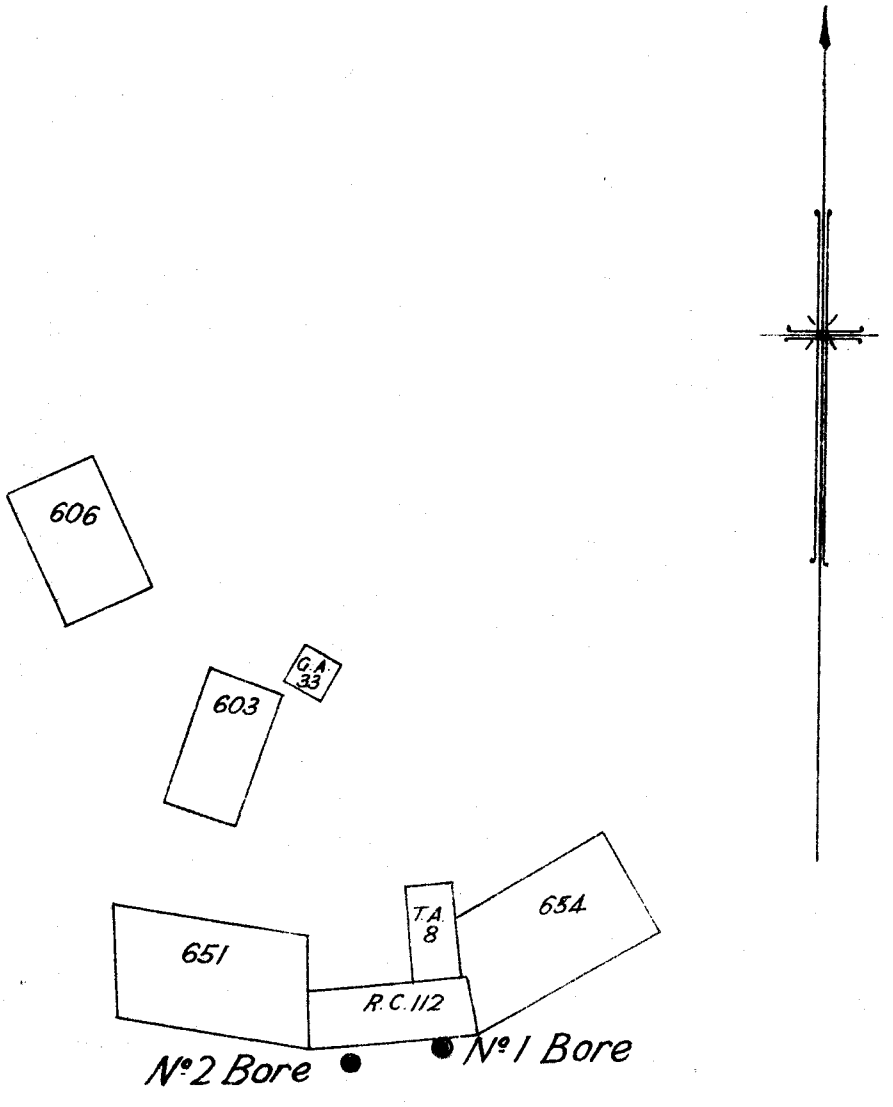
Values appear to have been on the low side in the main drive, but an east crosscut at 200 feet along the drive met with another lens of stone 18 inches in width. This was driven on and stoped to the 110 feet level for a length of 200 feet, giving 1,250 tons of ore of an average value of 27 to 28dwts. per ton, and an average width of 30 inches. At a point 200 feet from the shaft, a winze has been sunk to a vertical depth of 26 feet. At this depth, the hanging-wall reef was 18 inches wide and worth 21dwts. per ton. Near the shaft the reefs are broken and go off into stringers of quartz, but as the reef is seen at the

Locality Plan of Bores

LALLA ROOKH

20 0 20 40

– Scale of Chains –



LALLA ROOKH G.M

NORTH REEF

25 0 25 50 75

– Scale of Feet –

MAIN SHAFT No 1

140' Level

Shaft N° 2

Shaft N° 3

Dep 45°

R. C. 112

654

No 1 Bore

– PLAN OF WORKINGS –

MAIN SHAFT N°1

Shaft N° 2

Shaft N° 3

West Level

90' Level

6·5 - 30°

8·1 - 36°

54·3 - 54°

17·6 - 48°

5·7 - 48°

Underwoods Winze

4·8 - 36°

17·9 - 48°

25·7 - 18°

0·3 - 18°

21·8 - 60°

42·2 - 42°

4·4 - 42°

325 tons worth 75/- per ton

43·9 - 48°

11·7 - 18°

140' Level

6·1 - 36°

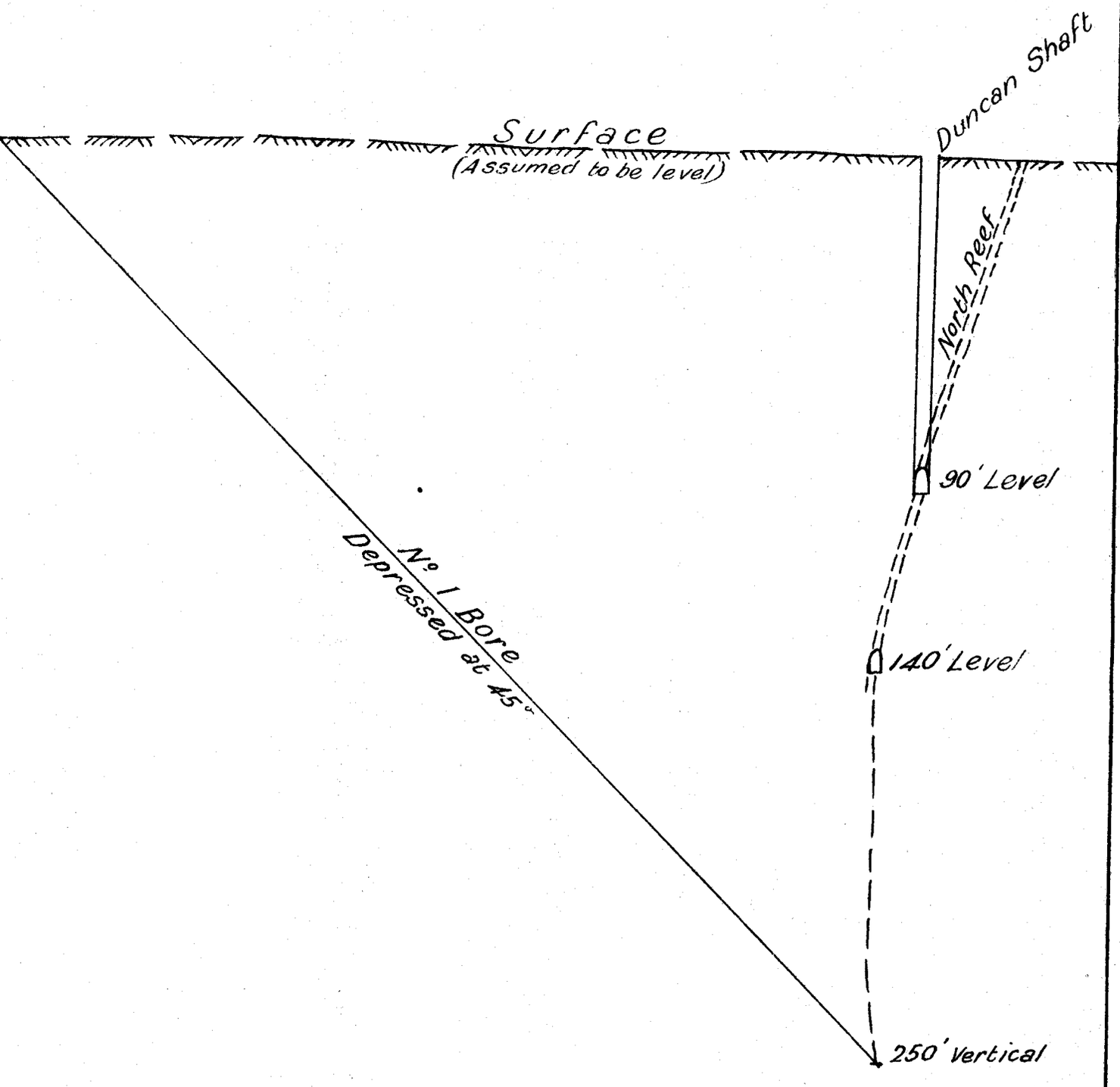
– LONGITUDINAL SECTION –

LALLA ROOKH G. M.

Cross Section on Nº 1 Bore at North Reef

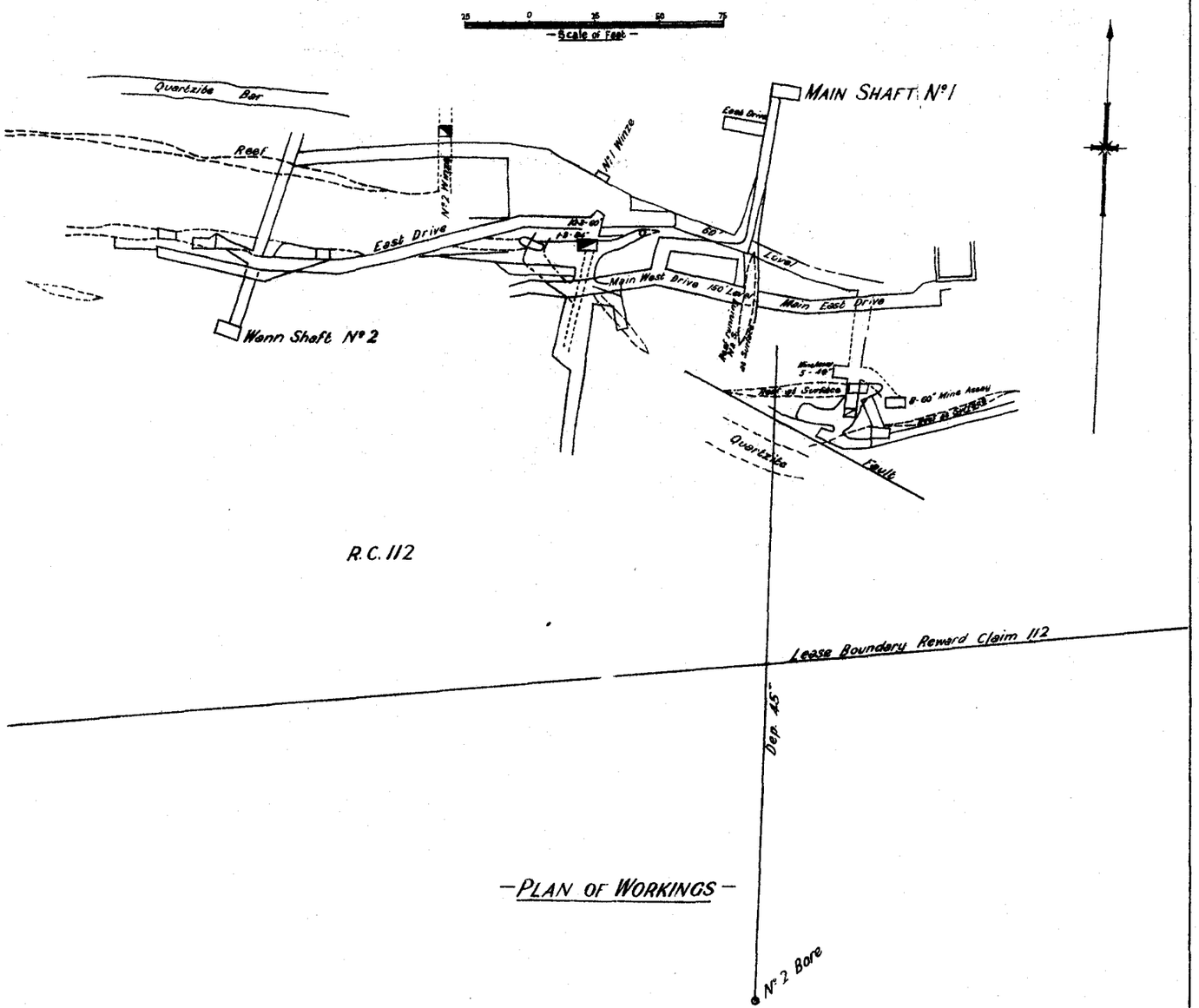
40 0 40 80

— Scale of Feet —

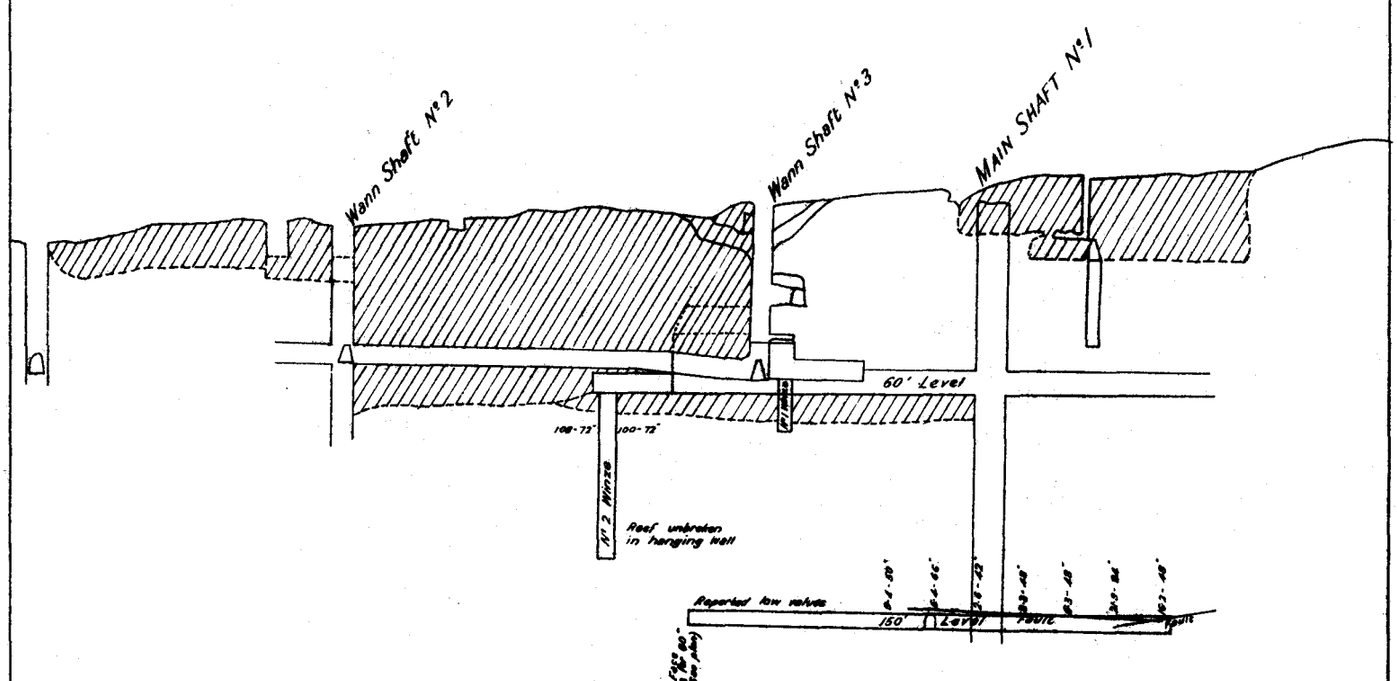


LALLA ROOK G.M.

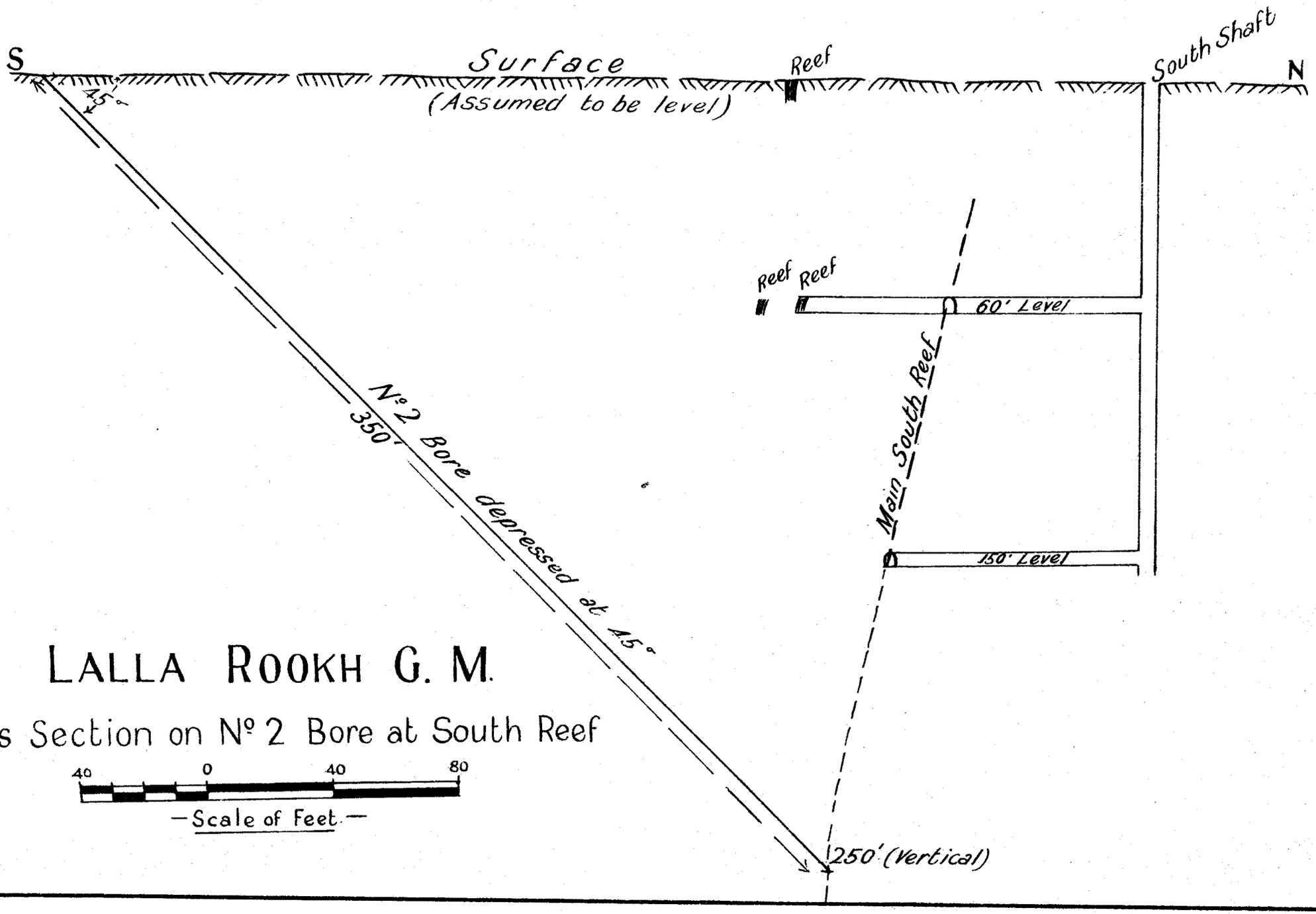
SOUTH REEF



— PLAN OF WORKINGS —



— LONGITUDINAL SECTION —



LALLA ROOKH G. M.

Cross Section on No 2 Bore at South Reef

40 0 40 80

—Scale of Feet.—

surface and outcropping further north, Mr. Blatchford considered that this splitting up was probably only temporary.

The average value of the stone crushed from the 150ft. to the 100ft. level is stated to have been about 36dwts. per ton.

The total ore treated, as reported to this Department, amounts to 6,386.65 tons, yielding 7,634.28ozs. of fine gold, or an average value of nearly 24dwts. per ton.

One of the original prospectors of the mine, Mr. Michael Doherty, accompanied me to the mine. He informed me that the shoots of ore all pitch east and proposed a bore 50 feet west of the main shaft, and I marked it out accordingly. However, now that I have put all the information available on to a plan, I am inclined to think that a better site would be at 170 feet west and recommend accordingly.

With regard to water supply, Mr. Cleland stated that the mine makes 1,500 gallons of water per day which is suitable for steam purposes. I made no attempt to go down the shaft to see what state of repair it was in. There is also a soak about half a mile south-west of the mine, and a well about 2½ miles north of the mine.

Note.—For further particulars concerning the Barton Mine, see Geological Bulletin No. 40, Pages 92, 93, 403 and 404, and Geological Bulletin No. 52, Pages 17 to 21, and Pages 124 and 125.

2.—JIMBLE BAR.

(27th April, 1929.)

Acting upon official instructions, I arrived at Jimble Bar on the evening of the 10th March, and I left on the 16th idem.

The special object of my visit was to investigate and report upon a request submitted by Mr. W. M. Marshall, M.L.A., from the Prospectors' Association at Jimble Bar for the erection of a State Battery at that centre.

The geology of this field and its early history will be found in the following official reports:—

File 116-26, Page 12, Mr. Deeble's report of 28th September, 1925.

File 116-26, Page 20, Mr. Deeble's report of 16th October, 1925.

File 116-26, Page 22, Mr. Deeble's report of 12th November, 1925.

File 116-26, Page 43, Mr. R. C. Wilson's report of 19th May, 1926.

File 116-26, Page 78, Mr. T. Blatchford's report of 16th October, 1926.

File 2012-26, Page 22, Mr. W. Deeble's report of 9th March, 1928.

File 2012-26, Page 24, Mr. A. Montgomery's comments, 16th March, 1928.

In the course of my inspection, I visited all the mines at present being worked as well as a number of prospectors' workings, which are at present idle. In most instances, I took samples and made compass surveys. I have prepared plans to accompany this report, which will enable the following description to be more fully understood:—

Shearer's G.M.L. 226L (Jimble Bar), formerly 434H.

As will be noted by reference to my report of May, 1926, the ore body consists of an ironstone lode formation on the eastern side of the western jasper bar. At the time that report was written, an underlay shaft (old shaft on plan), had been sunk to a depth of 25 feet and the lode had been exposed in six costeans. My samples from these costeans indicated the lode at the surface to be worth 17½dwts. per ton over a width of 9 feet and a length of roughly, 156 feet. Inspector Deeble, who had previously sampled these costeans, obtained a lower average, viz., 13dwts. per ton.

Since I wrote that report, an underlay shaft (Main Shaft), has been sunk 45 feet and a tunnel driven into the hill, along the lode for a distance of 173 feet, connecting with the shaft at a point 105 feet along it.

This shaft was begun in high grade ore, which I understand, however, gave out at a depth of about 30 feet, giving the impression that gold values were superficial only. At a depth of 40 feet, however, good values were again obtained. Samples taken by Mr. Blatchford at this depth assayed 18dwts. 22grs. for a width of 36 inches on the north end and 19 dwts. 7grs. for a width of 48 inches at the south end. In addition, a hanging wall bore proved another 12 inches of ore worth 18dwts.

The tunnel which was driven since Mr. Blatchford's visit, was sampled by Mr. Skuthorp and myself, and gave an average value of 66s. 6d. per ton over the 51 inches exposed. Details of sampling were as follows:—

No. of Sample.	Distance along Tunnel.	Width in inches.	Value.	Equivalent value in shillings.
	ft.	in.	oz. dwt. gr.	
J22	3	48	1 1 8	91/–
J21	13	48	0 18 0	76/–
J20	23	54	0 14 20	63/–
J19	33	54	1 9 12	125/–
J18	43	54	1 14 13	147/–
J16	53	54	1 16 22	157/–
J15	63	54	0 12 15	54/–
J14	73	48	0 10 16	45/–
J13	83	60	0 8 22	17/–
J12	93	48	0 5 6	22/–
J9	103	48	0 7 20	33/–
J8	113	48	0 7 10	31/–
J7	123	48	0 7 10	31/–
J6	133	48	0 14 7	61/–
J5	143	60	0 13 9	57/–
J3	153	48	1 2 12	96/–
J2	163	48	0 16 18	71/–
J1	173	54	0 5 21	25/–

Crosscuts from the tunnel have been put out at intervals to prove the full width of the lode with the following results:—

A west crosscut at 55ft. exposed a further 36in. of ore, assaying 79s. per ton.

An east crosscut at 105ft. exposed a further 36in. of ore, assaying 97s. per ton.

An east crosscut at 155ft. exposed a further 60in. ore, assaying 230s. per ton.

These results show the total width of payable ore to be 90 inches at 55 feet, 84 inches at 105 feet, and 120 inches at 155 feet, or an average width of 98 inches.

Ore Reserves.—The fact that there is a break in the values in the underlay shaft complicates the calculations of ore reserves. Possibly, of course, the shaft did not follow the best values.

If we assume that the whole of the ore between the tunnel and the surface will be taken out for an average width of 7 feet, the ore available may be computed as 3,229 tons.

(The average width at the surface was 9 feet and in the tunnel it was 8 feet 2 inches.)

Ore Broken: This may be somewhat as follows:—

	tons.
Tunnel, 173 feet, at, say, 2 tons per foot	346
Crosscuts, 11 feet, at, say, 2 tons per foot	22
Shaft, 30 feet, at, say, 2 tons per foot	60
	428

There will be in addition small amounts from costeans, etc., making a total of, say, 450 tons.

It is, I think, reasonable to suppose that this mine will produce 3,000 tons of ore between the tunnel and the surface, and that the ore at grass amounts to 450 tons. A further tonnage of ore which cannot be estimated at present, can also be anticipated below the tunnel, and its extension may open up additional ore supplies. At present, two men are at work here in driving the tunnel and crosscutting.

Jenkin's & Dorter's P.A. 140*L* (*old G.M.L.* 33*H*)./

This Prospecting Area adjoins Shearers on the south side. A little value occurs on the east side of the western jasper bar, where it projects above the surface. Some picked pieces assayed 36s. per ton, but no values have yet been found below ground. Jenkins and Dorter are at present repairing the Government Well. They say they will get out a crushing if crushing facilities become available.

Rosenow's P.A. 141*L* (*Old G.M.L.* 46*H*).

This Prospecting Area adjoins Jenkin & Dorter's P.A. 140L on the south side. A lode carrying occasional values has been exposed in costeans for a length of 240 feet. On my previous visit in 1926, two samples were taken, one of which assayed 1oz. 0dwts. 4grs. per ton over a width of 48 inches, and the other 1dwt. 23grs. over a width of 120 inches. On my recent visit four samples were taken, one of which assayed 53s. per ton over a width of 18 inches, and the other three were under 20s. per ton. A shaft is now being sunk to test the lode at a depth of 50 to 60 feet. Three men are at work here.

The Sunny South G.M.L. 223*L* (*Old G.M.L.* 37*H*).

This lease adjoins Rosenow's P.A. 141L on the south side, and is the most developed property on the field. The lode in this instance is alongside the eastern jasper bar, and is either in, or adjacent to a strong fault which throws the jasper bar to the south-west.

The main shaft has been sunk vertically to the 75ft. level and then on the underlay following the lode to a depth of 100 feet. The present face of the shaft is in sulphide ore, assaying 4s. per ton for a width of 42 inches. At 95 feet, however, a hanging-wall bench assayed 71s. per ton for a width of 42 inches, indicating that the present face is in the foot-wall of the best ore.

75ft. Level Workings.—The main north drive has been driven 80 feet. For the first 42 feet, the lode averaged 107s. per ton in value for a width of 44 inches. Beyond this distance it is pinched. At 72 feet, the drive has been turned to the west to pick up the western make of ore met with in the west crosscut at 35 feet north.

West Crosscut 35 Feet North.—This crosscut was put out 12 feet and encountered a western make of ore, which was driven on north for 18 feet. A sample taken half way along the drive assayed 43s. per ton for a width of 24 inches.

Main South Drive.—This drive has been driven 57 feet. For the first 10 feet, the lode averaged 130s. per ton for a width of 36 inches. At this point, the lode appears to have been cut off by a fault. The remainder of the mine is in formation, which I am informed carries low values only. For the last 8 feet, the drive has been turned to the east to put up the ore body met with in the south shaft workings.

44ft. Level.—A west crosscut from the main shaft at this level cut the reef just where a fault has cut it off going south. A north drive was driven 12 feet. A sample of the ore from this drive was taken by Inspector Deeble and assayed 1oz. 14dwts. 13grs. or 147s. per ton in value.

South Shaft.—A south shaft. which is 225 feet south by west, from the main shaft, has been sunk 50 feet and has encountered sulphide ore. At this depth a west crosscut passed through 16 feet of lode material, giving the following assay results:—

0ft. to 5ft.	7s.
5ft. to 10ft.	34s.
10ft. to 16ft.	32s.

Ore Reserves.—Regarding ore reserves, we know that there is a shoot of high grade ore at the 75 ft. level, 56 feet long and 3ft. 6ins. wide, averaging 112s. per ton in value. If this persists to the surface and is the same width and value, it would produce 1,225 tons of ore.

While this may occur, it has not yet been proved. A small tonnage may also be expected from the western make of ore. The ore at grass at the main shaft is about 200 tons, mostly obtained from development work. Although no proper estimate can be made of the ore this mine will produce, it seems reasonable to expect that it will produce at least 1,000 tons of good grade ore. At present four men are at work here, driving north and south at the 75ft. level.

The Windbag P.A. 138*L*.

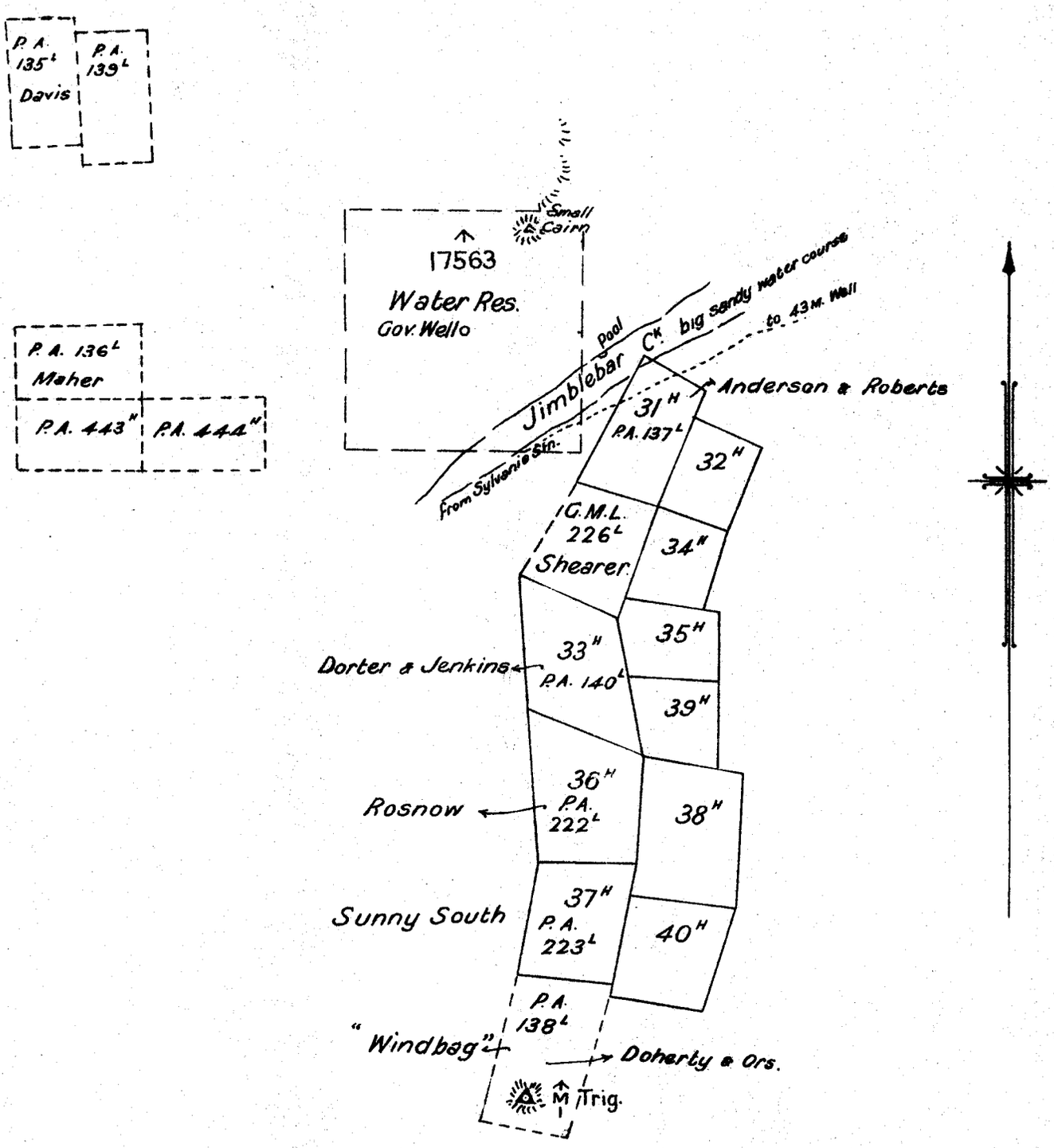
On this Prospecting Area there are three tunnels into the side of a hill, and one shaft is down 30 feet. No work was in progress, but one man said he was going to make a start there. The lode appears to be low grade where exposed. Two samples taken from a 40-ton dump of ore assayed 26s. per ton and 5s. per ton respectively.

Plan Shewing Mining Holdings

JIMBLEBAR

20 0 20 40

— Scale of Chains —



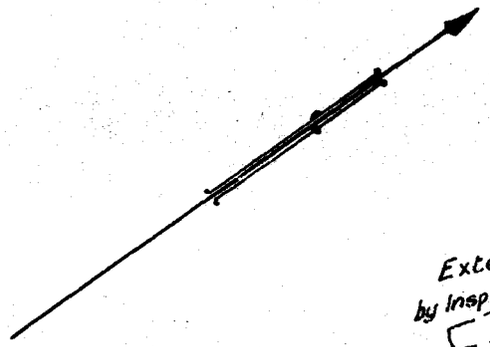
41H

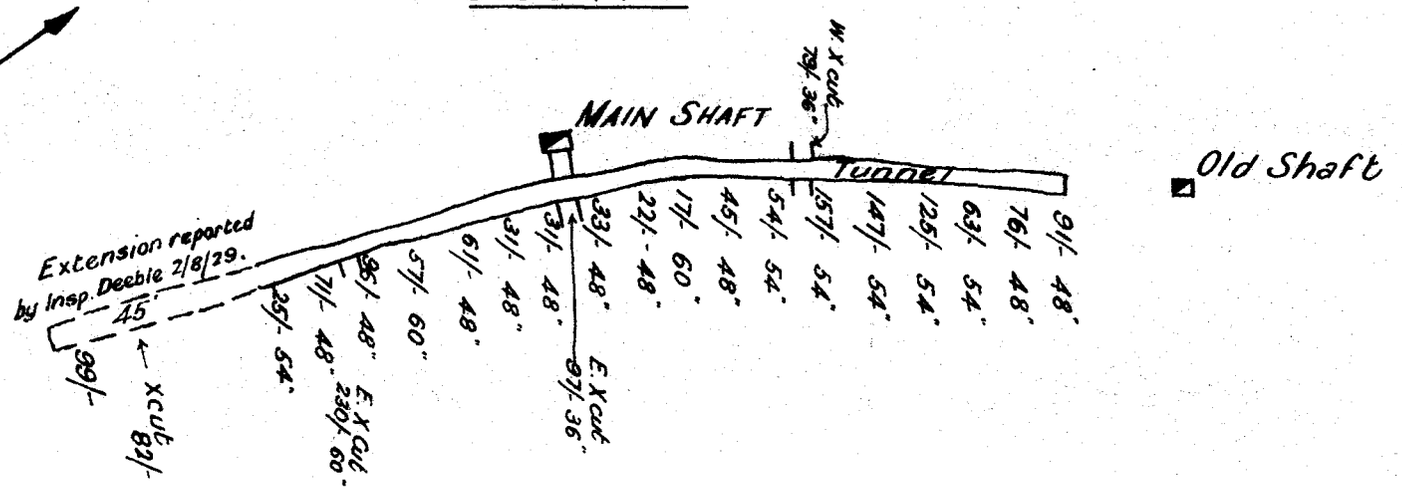
Plan and Longitudinal Section

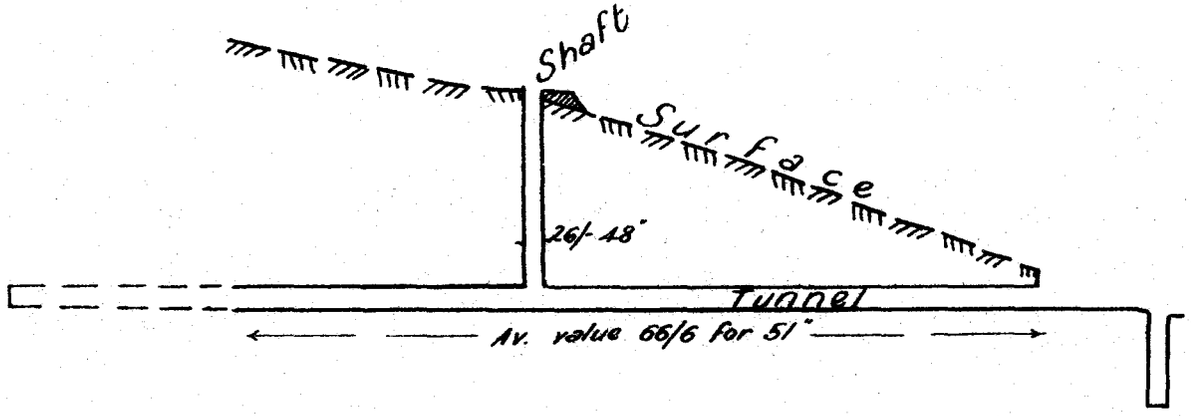
SHEARER'S G. M. L. 226 L

40 0 40 80

— Scale of Feet —

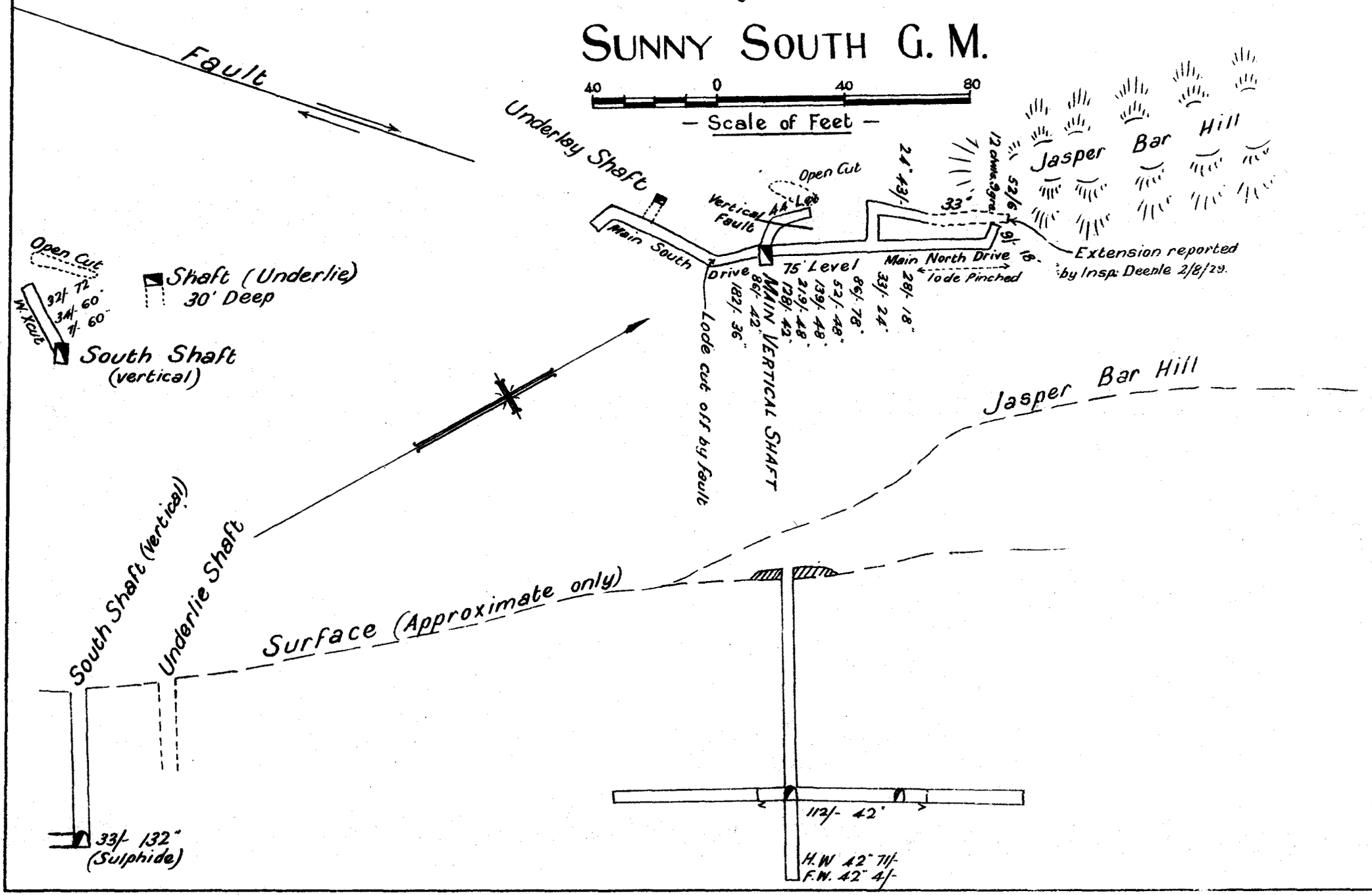






Plan and longitudinal Section

SUNNY SOUTH G. M.



Anderson and Roberts' P.A. 127*L* (*Old G.M.L.* 31*H*).

This Prospecting Area adjoins Shearer's G.M.L. 225L on the north. These two prospectors have located a little value on the east side of a jasper bar and have sunk a shaft 30 feet and are now crosscutting for the lode. Picked pieces off the bar assayed 52s. per ton, and a small 6 inch seam was worth 45s. per ton. Further prospecting may open up some ore here but none can be said to be developed at present.

Davis's P.A. 135*L*.

This Prospecting Area is situated about 2 miles north 17 degrees west from Shearer's. Small quartz veins have been worked, one of which, Davis informs me, yielded 13oz. 18dwts. of gold from 6 cwt. of ore. He is at present working a vein which is 12 to 18 inches in width. He has 20 tons at grass, a sample of which assayed 68s. per ton. Davis showed me some nice specimens. Small tonnages of good ore may be obtained here. At present he is working alone.

Dorter and Jenkins' Old Show.

Dorter and Jenkins did a little work about half a mile N. 30 degrees E. from Davis's Prospecting Area 135L. They took out 20 tons from a lode running N.E. and S.W. and dipping to the East at about 70 degrees. My sample of the dump assayed 3s. per ton only.

Maher's P.A. 136*L*.

This Prospecting Area is about half a mile to the south of Davis's P.A. 135L. Maher had sunk an underlay shaft 20 feet deep and had driven 10 feet on a lenticular quartz reef, striking N. 60 degrees W. and dipping to the south at about 60 degrees. The face of the drive assayed 11s. 6d. per ton only for a width of 15 inches.

Water Supply.

As indicated on the lease plan, there is a Government well near Jimble Bar Creek about 30 chains north by west of Shearer's G.M.L. 225L. The well, which is 60 feet deep, was under repair during my visit, part of the untimbered portion having broken away and fallen to the bottom. Jenkins and Dorter had begun to close-timber the well from top to bottom. Their estimate of the water making was 2,500 to 3,000 gallons per day. Owing to the quantity of dirt at the bottom of the well, I was unable to check this estimate, but it is probably somewhere near the mark and it seems clear that at present the water supply is insufficient for the requirements of a State battery, which may be put down at about 8,000 gallons per day.

On the Sunny South lease an attempt was made to obtain a water supply in anticipation of the erection of a battery there. A borehole was put down 91 feet, at which depth water is said to have been struck and to have risen 20 feet in the bore, the country rock being a soft talc schist. A water shaft was started about 18 feet from the bore and was sunk 90 feet. The bottom is in hard rock which the owners think is a bar. As they have now decided not to go on with the erection of a battery they have stopped sinking.

The position as far as water is concerned is that, although it may not be difficult to obtain an adequate supply, this has not yet been done. The Government well appears to me to be the more likely of these two shafts to provide the necessary water if deepened.

Summary and Conclusion.

As far as can be seen at present, a State battery, if erected, would have to rely almost entirely on Shearer's G.M.L. 226L, and the Sunny South G.M.L. 223L for ore supplies.

At Shearer's, there is a reasonable expectation of 3,000 tons of ore above the tunnel averaging, say, 60s. per ton. The extension of the tunnel may open up further supplies of ore, and an unknown quantity of ore will be obtained below it. At the Sunny South the ore available is not sufficiently developed for computation, but 1,000 tons or ore, worth an ounce per ton, are likely to be obtained above the 75ft. level. Below this level, the ore quickly changes to sulphide ore which may or may not be amenable to treatment without roasting.

It might be mentioned here that Messrs. Clarke and Moore's experiments at the School of Mines showed that the oxidised ore (ironstone gossan) presented no treatment difficulties.

No tonnage of any consequence can be relied upon from any of the other mines. Davis has a small parcel at grass and a few other small parcels could no doubt be obtained here and there, but anything else of any consequence still remains to be found. The ore broken and ready for crushing may be put down as being between 600 and 700 tons.

The water supply question is one that must be taken in hand prior to the erection of any battery. It may only be necessary to sink the Government well and drive to obtain the necessary supply.

The absence of crushing facilities is no doubt a very great handicap to the district, and it would be a matter of regret if the ore at present opened up had to remain untreated and two mines with payable ore going underfoot had to be abandoned.

My conclusions may be summarised as follows:—

(1) A water supply must be the first consideration.

(2) The shoots of ore already found will probably produce sufficient ore to keep a five-head mill running about two years, crushing between 2,000 and 3,000 tons per year.

(3) Further supplies will depend on the success of future prospecting and development work.

(4) Assistance to erect a plant on one of the principal mines would be the least costly method of providing crushing facilities.

(5) A State battery is likely to prove most satisfactory to all concerned, but will be costly. The Superintendent of State Batteries estimates the cost of a five-head mill complete with leaching plant and water supply at £9,250.

Later Information.

In August, 1929, Inspector Deeble visited the field and submitted a report on the work done since my visit in March.

The most important piece of work has been the extension of the tunnel at Shearer's G.M.L. for a further 45 feet, apparently in high grade ore. Inspector Deeble's two samples assayed 82s. and 99s. respectively. If it is assumed that this ore continues to the surface and is 6 feet in width, an estimated additional amount of ore of 1,210 tons will be available.

Inspector Deeble also reports that during the period between my last visit and his last visit 90 tons of ore were broken.

At the Sunny South G.M. Inspector Deeble obtained an assay value of 52s. 6d. per ton at the North End of the 75ft. level, indicating another make of ore, but there is nothing to show how much may be expected. It is not safe, therefore to increase the estimate of 1,000 tons worth 1 oz. per ton from this mine.

In round figures, therefore, my estimate of the ore available at Jimble Bar may be set down as follows:—

—	Tons.	Estimated Value.	Gold Contents.
			£
Shearer's G.M.L. ...	4,000	60/-	12,000
Sunny South	1,000	85/-	4,250
	5,000	65/-	16,250

Ore already broken and ready for crushing between 700 and 800 tons.

The oxidised ore is mostly an ironstone gossan, similar to that tested by Messrs. Clarke and Moore. Their summary as the results of their experiments was as follows:—

No difficulty should be experienced in treating this ore by—

(a) All sliming, amalgamation and cyanidation;
(b) Coarse grinding, amalgamation, classification and separate cyanidation of sand and slime product; or
(c) Comparatively fine grinding, amalgamation and cyanidation of the product by leaching after thorough mixing of sand and slime.

It will be noted that the total extractions by amalgamation and cyanidation in Tests Nos. 10 and 11 were as follows:—

—	Extraction per cent.		Total.
	By Amalgamation.	By Cyanidation.	
Test 10 ...	76·0	18·0	94·0
Test 11 ...	76·0	19·0	95·0

These very excellent results by amalgamation were obtained, however, by grinding with mercury in pebble mills and could not be expected to be obtained in stamp battery practice.

3.—BORING AT NORSEMAN.

(8th May, 1929.)

Acting upon official instructions I arrived at Norseman on the 4th April, and remained till the 8th April, 1929, the object of my visit being to select suitable sites for diamond drill boring at that centre.

I confined my attention mainly to two lines of lodes, viz.:—

(1) the Mararoa line of lode;
(2) the Norseman or Viking line of lode.

The two lines have produced large tonnages of ore in the past and appear to be the most likely to be the principal producers in the near future. They are situated about a mile to the east of the townsite and are approximately parallel to each other, both striking roughly north and south and dipping to the east.

The *Mararoa* line of lode, which includes the old Mararoa Mine and the recently developed New Mararoa, has produced 337,769 tons of ore yielding 166,869 fine ozs. of gold, or an average value of approximately 10 dwts. per ton.

The *Norseman,* or *Viking* line as it is sometimes called, includes the Sydney Norseman, the Hardy Norseman, the Mildura, the Scotchman, the Pride of Scotland and the Viking Norseman, and has produced 129,686 tons of ore, yielding 90,872 fine ozs. of gold, or an average value of 14 dwts. per ton.

Of these mines, the Mararoa, the New Mararoa, and the Viking are the only ones at present operating. After inspection I came to the conclusion that boring could be usefully carried out in testing—

(1) the deep ground under the north shoot of ore at the Mararoa G.M.;
(2) The deep ground under the workings of the New Mararoa G.M.;
(3) the deep ground under the workings of the Viking G.M.

A brief description of the occurrences in the vicinity of the sites selected for bores and the reasons for such selection are given hereunder:—

The Mararoa G.M.

This mine has been the largest producer at Norseman. The lode which has a north and south strike and is inclined to the east at an angle of 41 degrees from the vertical, has been worked in the old company's leases for a length of 2,800 feet. The bottom level, No. 10, has a vertical depth of 636 feet and an underlay depth of 960 feet.

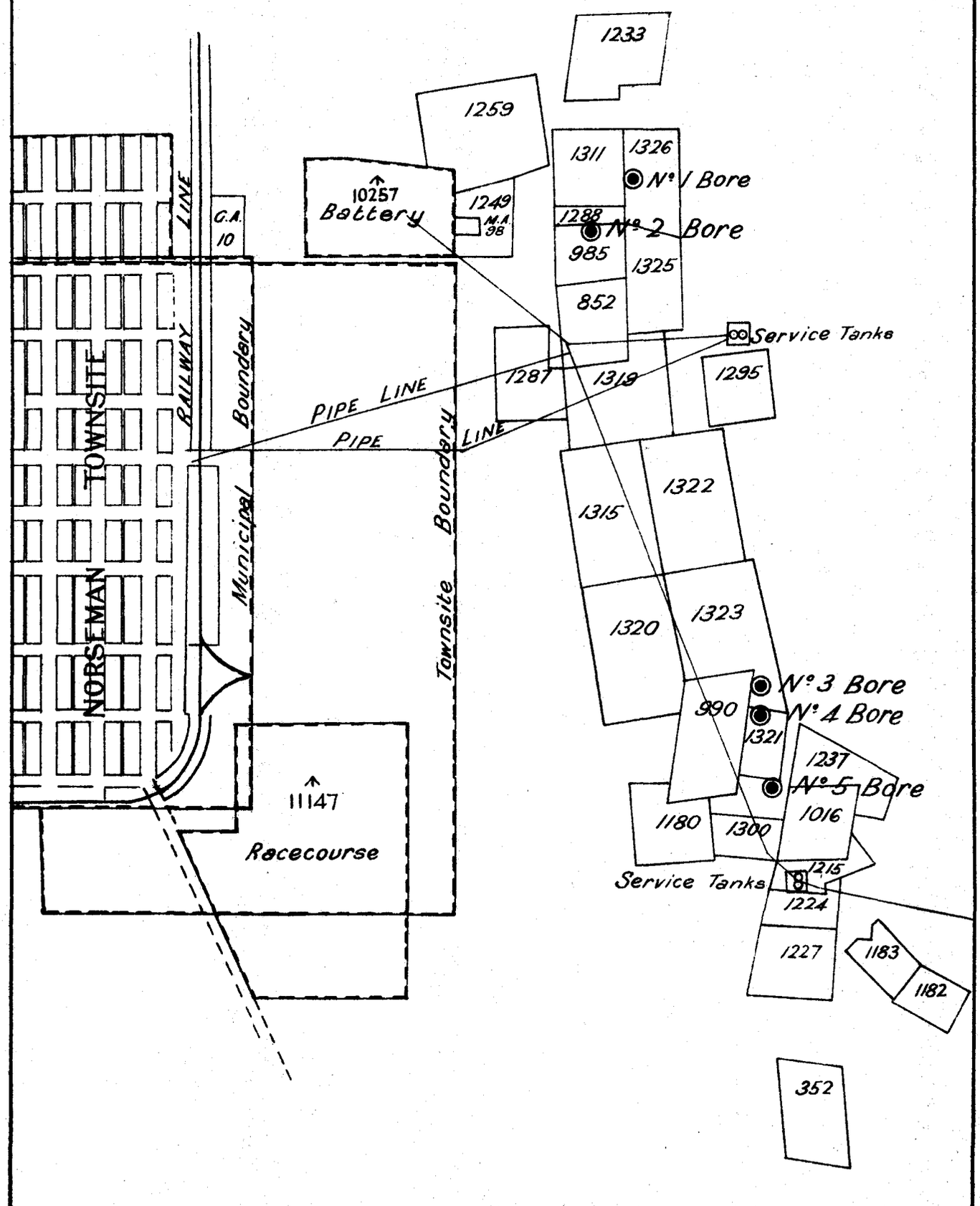
The bulk of the ore won was obtained between No. 4 level (240 feet) and the No. 7 level (440 feet), and at the north end of the mine it is remarkable that while the lode has been worked for a length of 700 feet all the ore won has been taken out between the No. 5 level (295 feet) and an intermediate level (402 feet). Little or no development work has been carried out to test the lode above or below these levels. I understand that values gave out overhead and were not looked for again. Underfoot the intermediate

Locality Plan of Bores

NORSEMAN

20 0 20 40

– Scale of Chains –



PLAN OF WORKINGS

VIKING GOLD MINE

Shewing Bore Sites

60 0 60 120 180

- Scale of Feet. -

1181

1320

990

1323

1321

1194

1060

OLD VIKING SHAFT

Nº 2 SHAFT

MAIN SHAFT

Nº 3 Shaft

Nº 4 Shaft

Mullock Pass

Hole to Surface

Winze

Rise

Nº 1 Level

Nº 2 Level

Nº 3 Level

Nº 4 Level

Nº 5 Level

Nº 6 Level

Nº 7 Level

Nº 3 Bore

Nº 1 Bore

Nº 5 Bore

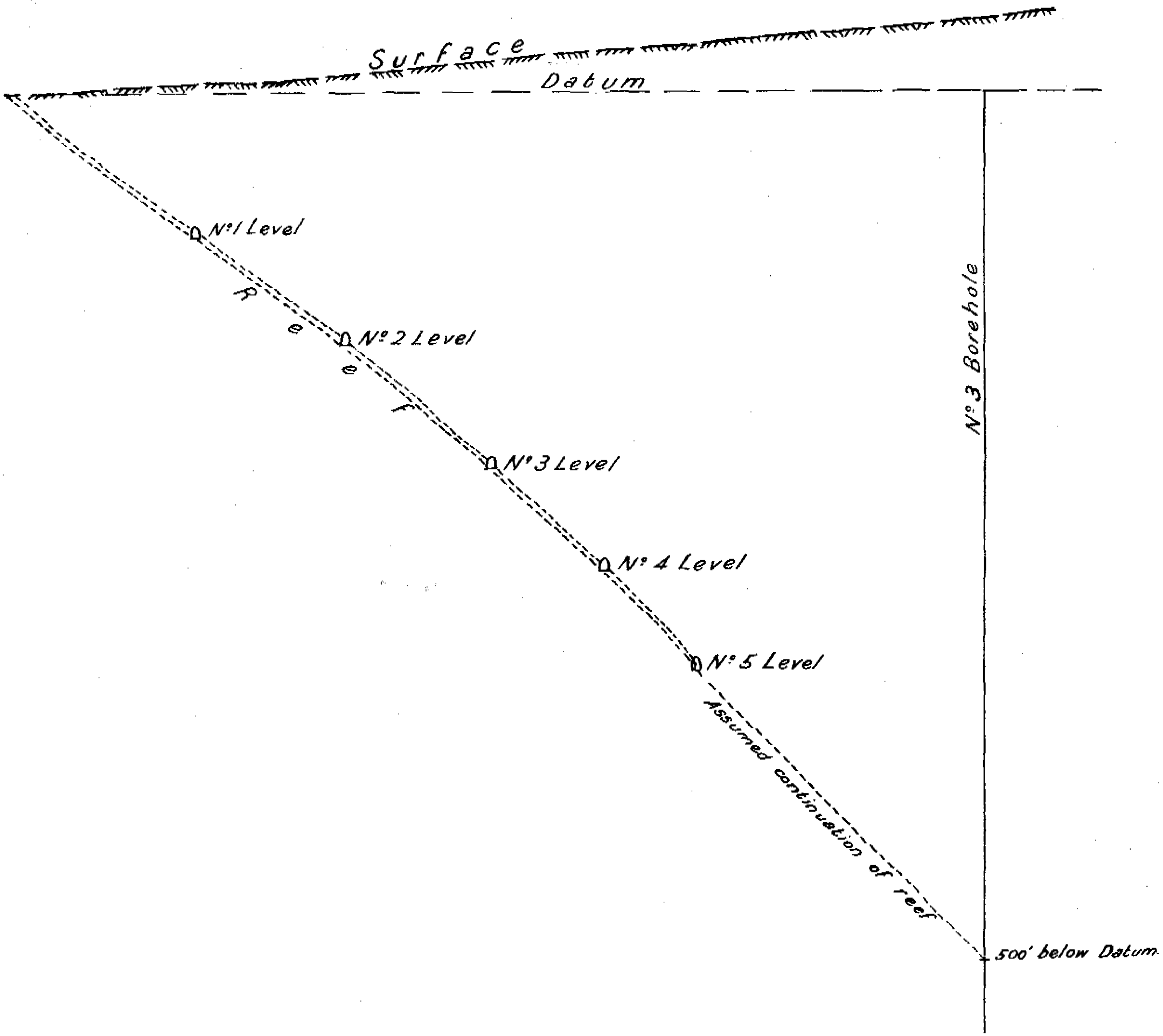
True North

Assumed North

— VIKING GOLD MINE —

— Cross Section at Nº 3 Bore —

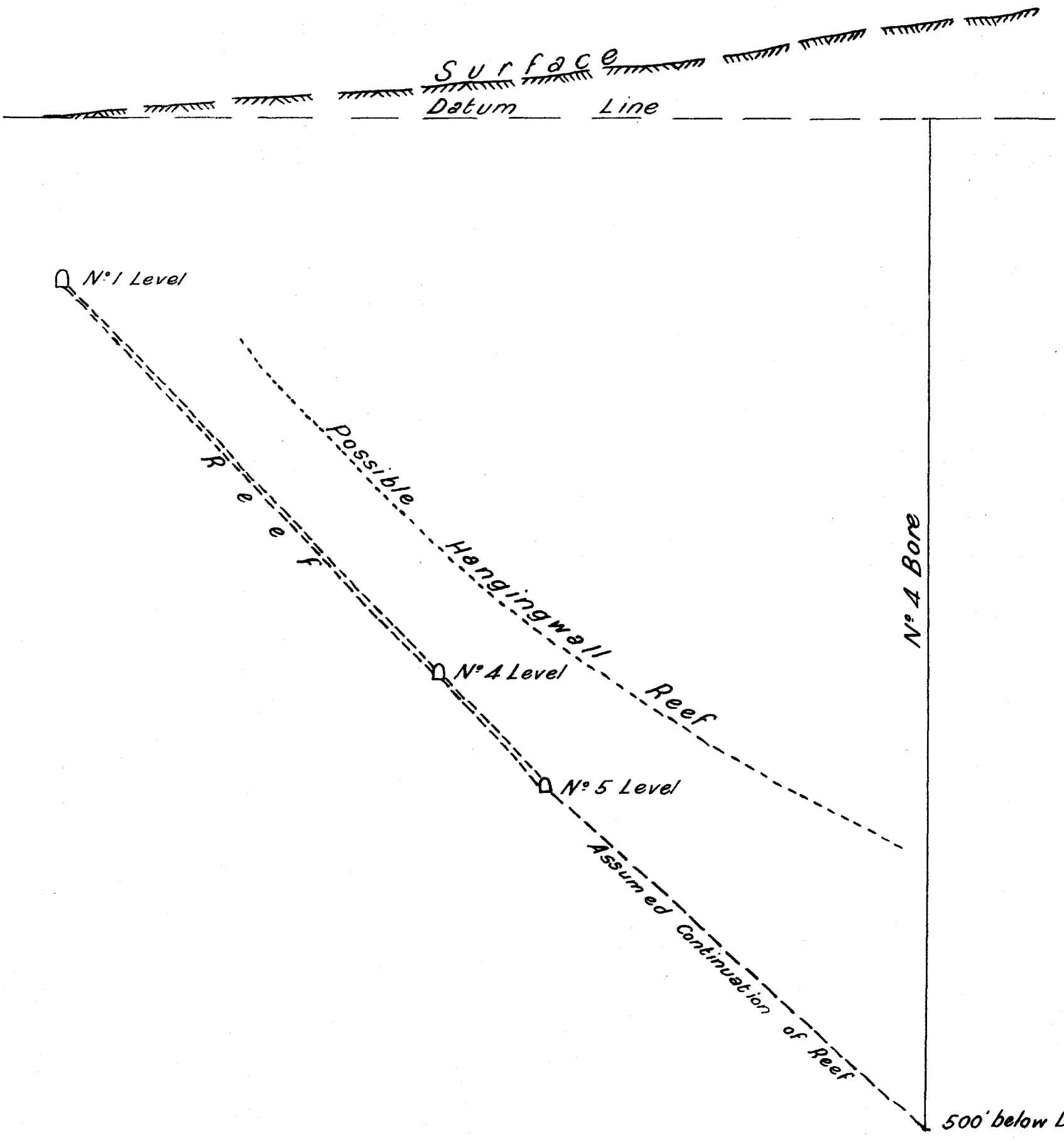
— Scale:- 60 Ft. = 1 In. —



— VIKING GOLD MINE —

— Cross Section at Nº 4 Bore —

- Scale: 60 Ft. = 1 In. -



level (402 feet), North Drive, off No. 2 Rise, which is the bottom level at this end of the mine, gave the following results:—

941 feet to 1,241 feet averaged 37s. for 58 inches.

1,241 feet to 1,312 feet averaged 23s. for 29 inches.

1,312 feet to 1,350 feet averaged 47s. for 33 inches.

These values are going underfoot and there is nothing to show how far they extend in a downward direction.

As the lode passes out of the owner's lease, No. 1311, at a vertical depth of 460 feet, which is 85 feet on the underlay below the intermediate level, its value can be conveniently tested on Crown land at a vertical depth of 540 feet and an underlay depth 200 feet below the intermediate level.

For these reasons I have recommended that the first bore be put down on the dividing line between Sections 27 and 28 to cut the lode at a vertical depth of approximately 540 feet below the collar of the main shaft, but as it starts on a hill about 100 feet above this level, the bore will be approximately 640 feet.

In addition, I would like to see a shallow bore put down on this syndicate's ground to test the lode at this end of the mine above the No. 5 level. As likely a place as any would be on the dividing line between Sections 23 and 24 set out as shown on the plan and section to cut the lode at a vertical depth of 200 feet (No. 2).

The New Mararoa G.M.

(G.M.L. 1315, 1320, 1322, and 1323.)

This mine, now owned by the Butterfly G.M. Co., adjoins the Mararoa G.M. on the south side, and is on the same line of lode which has a north and south strike and an underlay to the east at approximately 45 degrees. An underlay shaft has been sunk to a depth of 350 feet.

No. 1 level at 170 feet has been driven north 597 feet and south 358 feet. The reef has the lenticular habit. Going south it was irregular when passing through an actinolite dyke. It widens out again further south to 4 feet in width, but I understand from Mr. Nicholson that the average value is on the low side. Going north better values were obtained, but the reef is small in places. Good results were obtained in five winzes sunk below this level, all north of the shaft and all sunk about 30 feet, at which depth water prevented further sinking. I am indebted to Mr. Nicholson for the following information relating to these winzes:—

No. 1 *Winze* (60 feet north): This winze was sunk by Matthieson Bros. The reef was 4 feet on the north end and 2 feet on the south. Some stoping on either side of this winze, together with the ore from No. 1 winze and No. 2 winze, produced 240 tons of ore worth 16 dwts. 8 grs. per ton in value.

No. 2 *Winze* was started 166 feet north of the shaft. At the level the reef was 2 feet in width. It widens out to 8 feet in width at the bottom of the winze. The average value was between 40s. and 50s. per ton.

No. 3 *Winze* was started 290 feet north of the shaft. The reef was 8 to 10 feet in width and 40s. to 50s. per ton in value.

No. 4 *Winze* was started 390 feet north of the shaft. The reef was small at the level, but widened out to 8 feet. The assay results were as follows:—100s., 37s., 75s., 173s., 90s., 67s., and 75s.

No. 5 *Winze* was started 490 feet north of the shaft. The reef was 4 inches at the level and widened out to 4 feet. The following assay results were obtained—89s., 63s., 14s., 45s., 76s., 31s., 87s., 62s.

A level at 270 feet has been driven 239 feet north and 208 feet south. Good values were met with going north as soon as the reef got away from the actinolite bar. Further north the lode weakens, but a footwall crosscut at 200 feet north cut a strong body of quartz, which I understand carries good values. In the south drive I understand the values are not so good.

Boring could be usefully carried out to test the ore bodies at greater depth, say, 200 feet on the underlay below the 270 feet level. Boring seems most likely to be successful north of the shaft. I am not yet in a position to fix the exact sites as the mine has not been surveyed. Mr. Nicholson promised that this would be put in hand almost immediately.

The Viking G.M.

This is the only mine now operating on the Norseman line of lode. The owners have been driving north at the No. 6 level (352ft. vertical), and have reached a point 300 feet north of the shaft. A winze is also being sunk 250 feet from the shaft and is down 30 feet. The last few feet have met with high grade ore, the reef being 4 feet in width. It is difficult to connect up this make of ore with any known shoot. The winze appears to have just reached the top of a new shoot of ore. Between the No. 6 and No. 7 levels the reef is said to have been stoped for a length of 300 feet and to have averaged 4 feet in width. At the No. 7 level underfoot the reef is 24 inches in width according to Mr. McElaine, one of the owners. A bore hole (No. 5) to test this ore body at a depth of 200 feet on the underlay below the bottom level No. 7, could be put down on Crown lands as indicated on the plan accompanying this report. Its vertical depth will be approximately 550 feet.

Reference to the plan shows that the lode worked from the new shaft has an average inclination of 56 degrees from the horizontal, while that worked from the old shaft has an average inclination of 45 degrees. It seems to me therefore to be just possible that these are not one and the same lode. Boreholes Nos. 4 and 5, that I have marked out on the plan, would serve to decide this point. They are laid out to cut the lode worked in the old shaft at 500 feet. If the lode worked in the new shaft turns out to be another lode in the hanging wall of the other it should be cut at a shallower depth.

4.—WESTRALIA MT. MORGANS G.M.

(15th October, 1929.)

On 9th August, I visited the Westralia Mt. Morgans G.M. in company with Messrs. Meecham and Beresford to look into the possibilities of locating

further supplies of ore there by means of diamond drilling, and have to report as follows:—

Geology and General Description of Mine.

Mr. C. F. V. Jackson in Geological Bulletin No. 18 described this ore deposit as follows:—

> The deposit is by far the most important of any in this district. Apart from its size and irregular nature it has many points of interest not the least being its similarity of origin to the banded and haematite-bearing quartz lodes which though elsewhere frequently associated with auriferous deposits are not themselves generally highly gold-bearing.
>
> At Mount Morgans conditions have been highly favourable along the contact of the intrusive mass of porphyry for the formation of an area of highly crushed and foliated rock and the production of zones of weakness in which the lode forming processes have taken place.

A huge jasper bar can be traced traversing the country in a north-westerly direction, and forming a conspicuous ridge. Series of porphyry dykes, some of very considerable size, are associated with this jasper bar, and it seems probable that the solutions given off by the porphyry during solidification found their way to the surface through cracks and shattered portions of the jasper bar and deposited their gold contents there. The porphyry may therefore be regarded as the original holder of the gold and the jasper bar the present one. As the upper portions of the bar are most likely to be shattered and cracked, the most enrichment was to be expected in the upper levels. This was found to be the case. Though good values were found in a number of parallel lodes near the surface, these did not as a rule persist much below a depth of 300 feet.

Mr. Beresford drew my attention to the fact that while a considerable amount of crosscutting had been done in a westerly direction from the Main Shaft with very successful results, little or no crosscutting had been done in an easterly direction. Furthermore, he tells me that some values were met with when cutting out the ground for the foundation of the plant. He therefore suggests that this eastern country is worth testing by means of a bore. I am inclined to agree with him, especially when it is borne in mind that up to 30th June last the production from the mine was 791,762.82 tons, yielding 359,875.86 fine ounces of gold, equivalent to £1,529,472 approximately. As likely a site as any seems to be at Section 10 which is 185 feet south of the Main Shaft. Good values have been met with in the lodes already located in this vicinity, and it therefore seems to be a likely place to look for values in a parallel lode.

I have marked out on the ground a site for a bore at Section 10 at a horizontal distance of 250 feet east of most easterly lode. This bore, if depressed at 45 degrees, would prove all the ground between it and the lode in 355 feet of boring.

As an alternative bore, I would suggest a horizontal east bore at the 200 feet level at the same distance south of the shaft. Provided that the cost is the same in both instances. I would rather prefer the horizontal bore.

While at the mine I made inquiries as to whether, at any part of the mine, there were values going underfoot, and I was informed that payable values are going underfoot below the No. 3 level in Section J, where a shoot of ore 150 to 200 feet in length was taken out from the 200ft. level to the surface. Above this level the lode was stoped for a width of 10 feet, and averaged 40s. per ton in value. At the 100ft. level the lode averaged 58s. per ton for a width of 60 inches. A bore might with advantage be put down to ascertain whether these values persist, say another 200 feet. I have set out such a bore on the ground to cut the lode at a depth of 400 feet between Sections 29 and 30, the bore to be depressed at 60 degrees.

General Remarks.—As it is the experience on this mine that the best values do not persist to any great depth, and as a matter of fact the greater portion of the ore won has been mined above the No. 2 level, I think that the proposed bore to test the country east of the present workings is the more likely to disclose a payable ore body. At the same time when values exist underfoot their downward extension must always be given a chance.

I would suggest therefore that a bore to test the eastern country be the first bore and that should any lode or lodes be met with, the question of further boring in this direction should receive consideration.

5.—RIVERINA PROPRIETARY.

(17th May, 1929.)

The principal lode in this property which has a strike approximately north and south and is nearly vertical, has been worked for a length of over 2,000 feet. The average width worked would probably be somewhere between three and four feet. The ore won amounts to 28,450 tons yielding 21,610.49 ounces of fine gold or an average value of 15.2 dwts. per ton.

The plan shows that the southern shoot of ore has been developed to a depth of 485 feet, and that there is a block of ore containing 4,000 tons worth £12,000 between this level and the 585ft. level. The shoot met with at 1,800 feet north is known to persist to a depth of 50 feet below the 280ft. level and the shoot at 1,100 feet north has been proved down to the 280 feet level.

It seems well worth while to ascertain by boring whether the northern shoots of ore live to greater depths or not. I recommend that two bores be put down as follows:—

No. 1 Bore to be laid out as shown on the plan to intersect the lode at a point 220 feet south of shaft 1,800 feet north and at a depth of 480 feet. This bore is laid out on the assumption that the shoot of ore pitches south by an amount of 160 feet in 200 feet vertical.

No. 2 Bore to be laid out as shown on the plan to intersect the main lode at a point 240 feet south of shaft 1,100 feet north and at a depth of 480 feet. This bore is laid out on the assumption that the shoot of ore also pitches south at the same rate.

Further boring might possibly be considered if the results of these two bores are sufficiently encouraging.

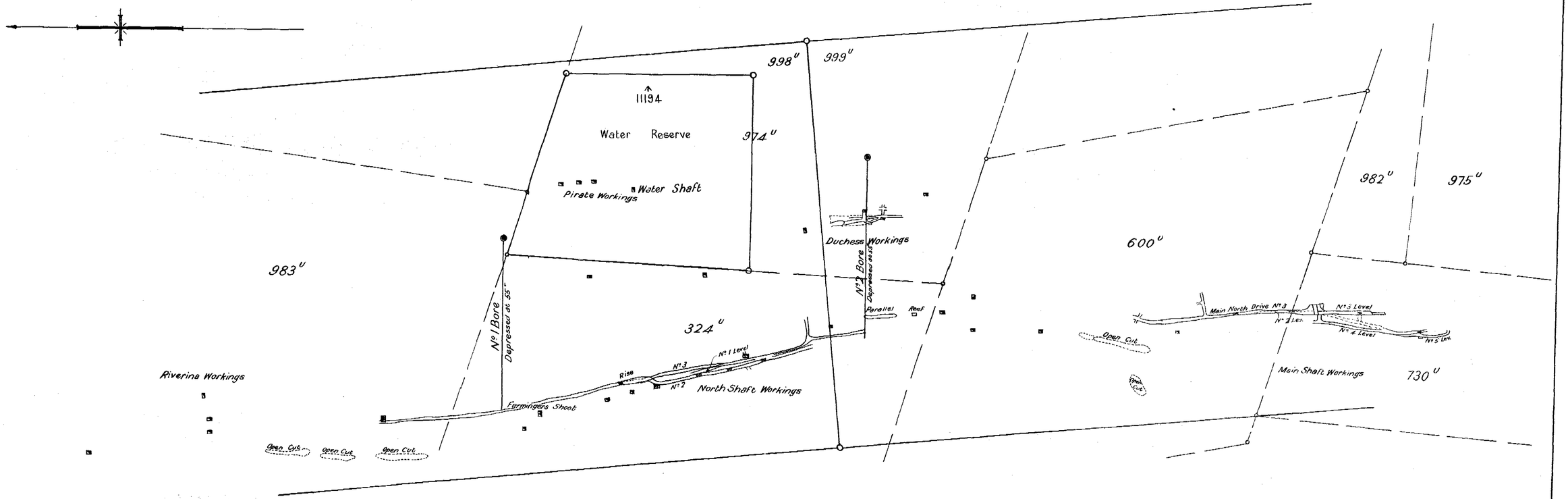
As these bores will be on the leases of the Riverina Proprietary, it will be necessary either to obtain an undertaking from the Company to repay us the cost of boring in the event of success or foreclose on the property.

Plan Shewing Bores

RIVERINA PROPRIETARY G. M.

100 0 100 200 300

– Scale of Feet –



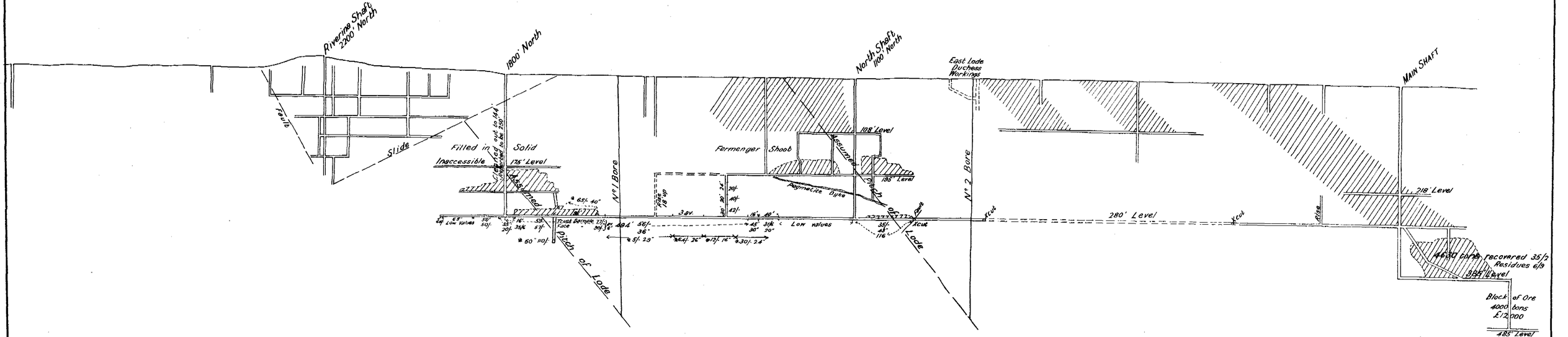
Longitudinal Section

RIVERINA PROPRIETARY G. M.

Shewing average values reported by old Riverina South G. M. Co N. L

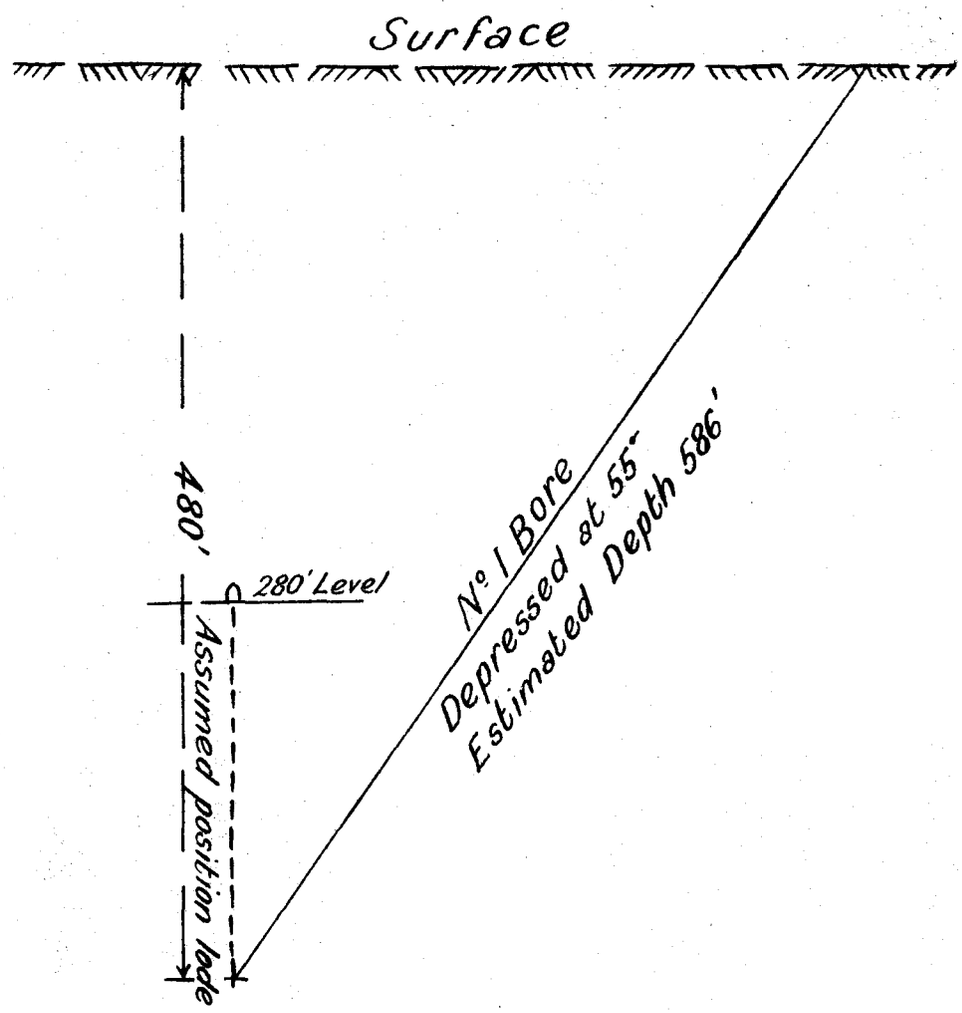
100 0 100 200 300

— Scale of Feet. —



* Samples taken by Mr R. C. Wilson

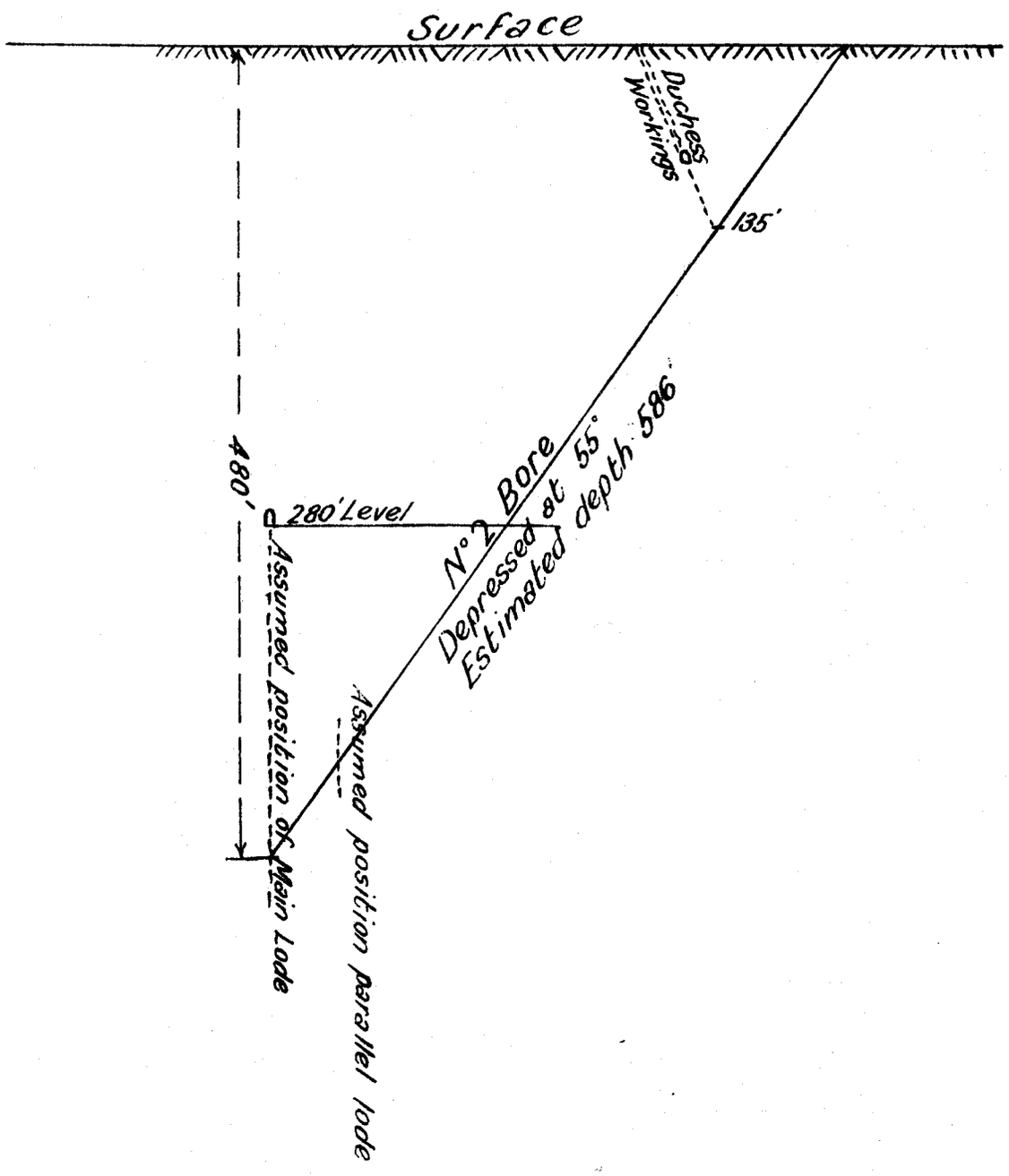
— Cross Section at Nº 1 Bore —
— RIVERINA PROPY G.M. —
— Scale:- 100 Ft. = 1 Inch. —



– Cross Section at Nº 2 Bore –

– RIVERINA PROPY G.M. –

– Scale:- 100 Ft. = 1 In. –



6.—TIN FIND AT HOLLETON.

(5th September, 1929.)

Acting on official instructions I visited Holleton on the 3rd August, 1929, accompanied by Dr. Simpson and Inspector Rockett, and have to report as follows:—

Moller & Thompson's P.A. 1842.—These two prospectors report that they discovered tin on this Prospecting Area when the ground was still held for gold mining purposes, and that they waited for some months for the ground to be thrown up to enable them to take it up for tin. Their Prospecting Area is situated half a mile south 30 degrees west of the townsite, and almost adjoins the original Reward Lease granted to Messrs. Hollow and Heaton who first discovered payable gold at this mining centre. Unfortunately, neither Mr. Moller nor Mr. Thompson were present during our visit.

Geology and General Description.—The tin occurs in pegmatite dykes in greenstone country. The pegmatite dykes are stated to cut right through the quartz reefs where they meet them, proving the pegmatite to be younger geologically than the reefs. They consist mainly of albite, felspar, microcline, and quartz, and in addition to cassiterite contain small quantities of zircon, magnetite, garnet and ilmenite. The greenstone alongside the tin-bearing pegmatite is an unusually coarse-grained amphibolite. The principal tin lode is nearly vertical, and strikes north 25 degrees east. A shaft has been sunk on it for a depth of 10 feet. The shaft has exposed three feet of tin-bearing pegmatite without exposing the western wall. Two samples taken at a depth of 5 feet average 0.48 per cent. metallic tin, over a width of 36 inches, and one at 10 feet assayed 1.47 per cent. metallic tin over a width of 30 inches. A sample of the broken ore at the surface assayed 1.17 per cent. tin, and a check sample taken by Dr. Simpson assayed 0.94 per cent. tin. These two samples might be expected to be on the low side, as some of the best ore had been taken away as specimens. Tin ore from a pothole 170 feet south of the shaft contained 1.02 per cent. metallic tin and a sample from a pothole 50 feet north 0.56 per cent. metallic tin. Samples from three other potholes contained traces only of tin.

Latham's P.A. 1864.—This Prospecting Area adjoins Moller and Thomson's on the northern side. A sample of pegmatite at the surface of an old shaft stated to be from a vein 12 inches in width, contained traces of tin and in addition ilmenite, magnetite, garnet, zircon and rutile.

Larsen's P.A. 1855.—This Prospecting Area adjoins Moller and Thomson's P.A., running more or less east and west. A strong pegmatite occurs at the boundary of these Prospecting Areas. It contains albite, quartz, biotite, garnet, ilmenite, magnetite, and spinel, but my sample contained no tin.

Hope's P.A. 1773.—This is situated 50 chains east of Holleton townsite. Loose pieces of pegmatite from a costean contained traces of tin, and in addition garnet, ilmenite, zircon, leucoxine, rutile, zenotime, galena and pyrite.

Plush's P.A. 1638 is just west of the townsite. A sample taken from some loose floaters did not contain any tin.

The Manfred G.M.L. 3320.—This lease is situated about 40 chains east of Holleton townsite. At the request of a prospector, I sampled two dumps for gold contents. A dump of about 6 tons at the windlass shaft assayed 2 dwts. 4 grs. of gold per ton, and one of about 8 tons at another shaft assayed 1 oz. 1 dwt. 2 grs. of gold per ton.

General Remarks.—The occurrence of tin in the pegmatites at Holleton is of considerable interest, and suggests the possibility that some of the other pegmatites which are so common in the Yilgarn district may also be tin-bearing. The nature of the occurrence is very similar to that at Poona, Coodardy, and other parts of the State. Some fine specimens were obtained by Moller and Thompson. The general average of ore exposed in shaft down to a depth of 10 feet appears to be on the low side. I understand that sinking has been continued, and that a crushing is shortly to be put through the State battery at Coolgardie, the results of which will be watched with interest.

No. 7.—MARTHA OLIVER'S P.A. 486H FOR MICA.

(12th October, 1929).

As instructed, I inspected this Prospecting Area on the 23rd September, 1929, and now submit my report upon it.

Location: The Prospecting Area under review is a 24-acre block, 20 chains in a north and south direction by 12 chains east and west, and is situated about half-a-mile south-west of the Mullalyup Railway Station.

Nature of Occurrence and General Description.

Three mica deposits have been located on the area. In each case, the mica occurs, as is usual, in a pegmatite dyke, while the country rock in this vicinity is a micaceous schist. Brief details of each of these deposits are as follows:—

1. *Mica near South-West corner of Area.*—A large pegmatite dyke occurs at the corner of the area, apparently over 100 feet wide in the widest portion. Its strike is nearly north and south, following the western boundary. Quite a large number of pot holes, costeans, and shallow shafts are scattered over this pegmatite dyke, which allow it to be examined at a number of points. Their distribution is very irregular. Apparently, Mr. Oliver's only system was to open up the dyke at any point where it looked at all encouraging at the surface. This dyke is composed very largely of the potash felspar "microcline," which in places appears to be sufficiently free from quartz to admit of its being mined for that mineral. In other places, it has a quantity of quartz mixed with it, while mica occurs more or less irregularly through it. Other minerals recognised in smaller amounts, were the soda felspar albite, tourmaline, biotite and beryl.

Small heaps containing a cwt. or two of scrap mica are lying about. The mica is of marketable size, three inch and four inch squares are common, but I saw very little sufficiently free from cracks and flaws to produce sheets of good quality.

On present appearances, the mica present in this dyke is not sufficiently plentiful to admit of its being mined for the mica contents alone. The only chance of success would be a steady demand for felspar at a price that would defray mining costs. At present I understand that while £4 per ton was paid by the Calyx Pottery Company for good grade felspar, a lower price is ruling in the Eastern States.

11. *Mica near South-East corner of Area.*—A large pegmatite dyke, very similar in all respects to that already described, occurs in this portion of the area. It has a north and south strike and appears to be over 100 feet in width. The few potholes and costeans put down indicate that, like the dyke at the south-west corner, it consists for the most part of microcline felspar and contains smaller percentages of quartz and mica, the latter being for the most part of poor quality.

111. *Mica at North-West Corner of Area.*—Smaller pegmatite dykes occur in this portion of the area. A small open-cut has exposed a pegmatite bar striking a little east of north and apparently about 4 feet in width. Unlike the dykes previously described, it consists for the most part of quartz and contains little or no felspar. Mica appears to be rather more plentiful and is of marketable size. A few cwts. of scrap mica are lying at the surface. Fair sized sheets occur here, but they have suffered from surface weathering and are now badly ironstained. Better mica might be obtained at a depth of 10 or 20 feet.

General Remarks.—The general position seems to be somewhat as follows:—

Two large pegmatite dykes have been located at the south end of the Prospecting Area which are both apparently at least 100 feet in width and are seen outcropping on the southern fall of a hill. They consist largely of the potash felspar microcline together with quartz muscovite mica, albite, biotite, tourmaline, and beryl.

The mica occurs in marketable sizes, but is largely of poor quality and I do not think either of these deposits could be successfully worked for their mica contents alone.

As combined felspar and mica deposits, these two dykes are worth bearing in mind. As a felspar deposit alone, some other pegmatite dykes in the State look more attractive.

The smaller dykes at the North portion of the area give the best show of mica. All that can be seen, however, is much weathered and ironstained. Some better mica might be obtained here a little deeper down.

8.—FELSPAR AND BERYL DEPOSIT AT FERNDALE.

(16th October, 1929.)

When at Mullalyup recently, inspecting Oliver's mica deposit, I took the opportunity to revisit the beryl deposit at Ferndale which I reported upon in September, 1925,* and came to the conclusion that isolated rich patches of beryl occur through two large coarsely crystalline pegmatite dykes, but that these patches are so far apart that it would be unprofitable to prospect and mine the deposit for its beryl contents alone. If, however, there were a steady demand for felspar I thought it might be worked for its felspar contents, beryl being obtained at the same time as a by-product.

Quite recently a local syndicate has carried a working quarry face into the hill, a distance of 60 feet, the present face being about 13 feet wide by 16 feet high.

During the course of these operations, I am informed, approximately 150 tons of felspar and 2 tons of beryl were obtained. Most of the felspar was sold to the Calyx Porcelain Co., Ltd., smaller amounts being sold to the Hoffman Brickworks, Melbourne, and Lempriere & Co. The beryl is still at grass. As the face stands, an area of about 6ft. x 4ft. consists of almost pure felspar, principally the potash variety, microcline. Elsewhere there is a small percentage of quartz through the felspar—a little mica and a negligible amount of tourmaline. No beryl was showing in the face, but some bunches of it were passed through during the quarrying operations.

Mr. H. Bowley, Senior Mineralogist and Analyst, accompanied me to this deposit, and made a close examination of its constituent minerals. Mr. Bowley also has a knowledge of pottery requirements and informs me that small percentages of quartz and mica in the felspar would not materially reduce its value provided that a uniform product could be relied upon. He expressed the opinion that the whole of the present face of the quarry, if crushed, would make a marketable product.

If such is the case the expensive process of hand picking can be eliminated and the cost of production very materially reduced.

Mr. Oma, one of the owners, advised me that he would break down a few tons to serve as a bulk sample, and endeavour to put it on the market.

I understand that representations are also being made to the Federal Government for a protective tariff on ground felspar, which is at present being imported from Norway.

Large tonnages can be easily and cheaply broken out from the pegmatites and with a little care a uniform product should be obtainable.

9.—PROPOSED BORING AT HANNANS NORTH G.M.

(4th November, 1929.)

As instructed, I visited Kalgoorlie on the 30th September, 1929, to look into the question of boring at the above-mentioned mine, and beg to report as follows:—

Location: This mine is situated at the north end of the Kalgoorlie field, its location being one mile north of the Kalgoorlie Post Office and four miles north-west of the Great Boulder Proprietary Mine.

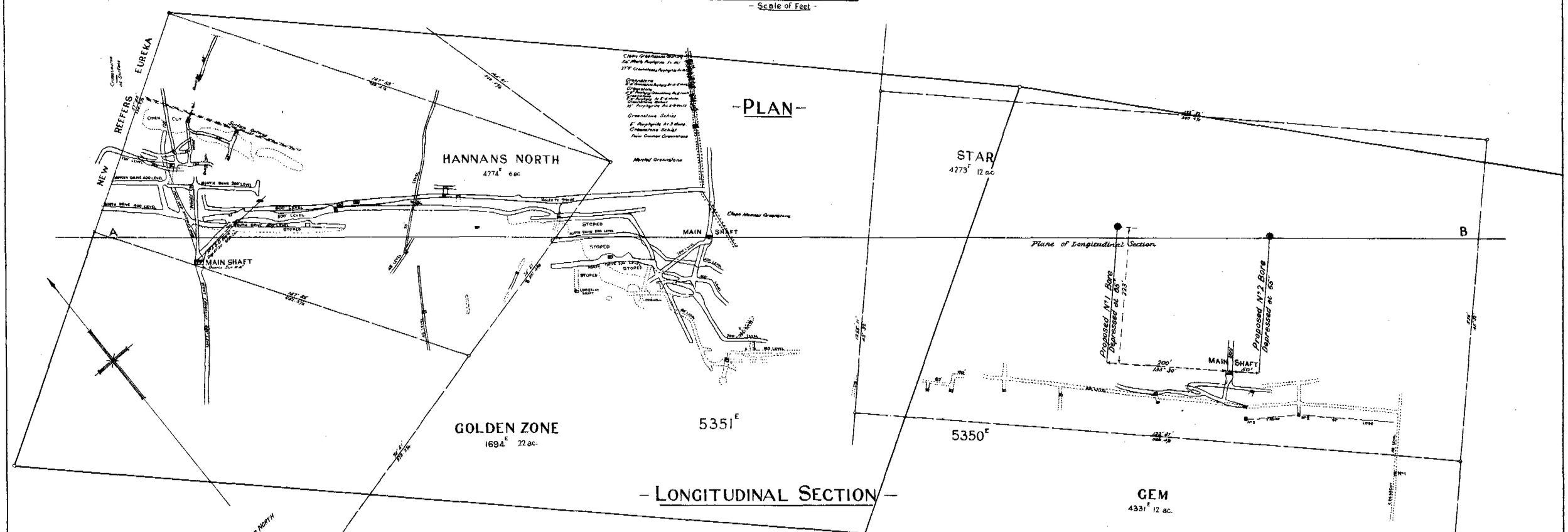
General Description: The lode strikes north-east and south-west and is nearly vertical, having a slight inclination to the east. It has been worked to a depth of 600 feet, at which depth stoping operations extend over a length of 700 feet. An assay plan submitted by the Great Boulder Proprietary

* This report is published in the Annual Report of the Mines Department for 1925.

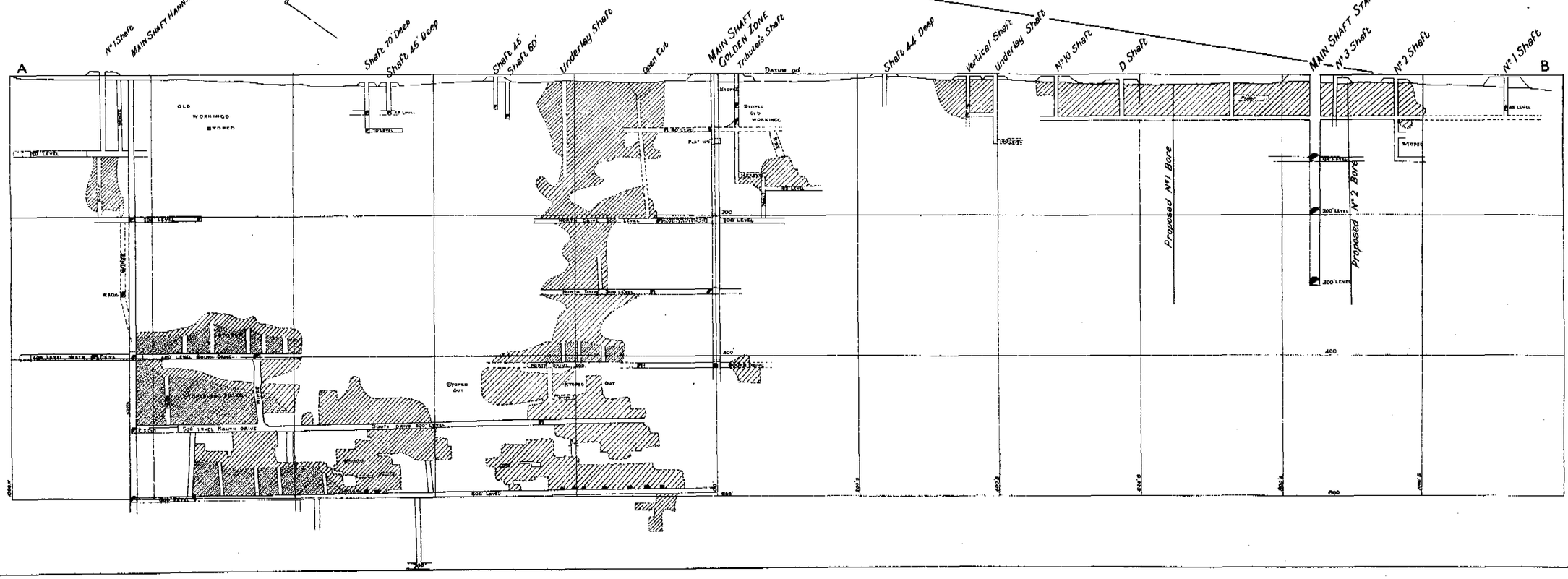
HANNANS NORTH G. M.

Scale of Feet
60 0 60 120 180

PLAN



LONGITUDINAL SECTION



Limited shows that, at the 600ft. level, the lode averages approximately 1 oz. per ton in value for a width of 33 inches. A winze at 400 feet south has been sunk from this level for a depth of 100 feet. The samples indicate the ore in the winze to be worth about 13 dwts. per ton, but no widths are given. At a depth of 700 feet, 40 feet of driving off the winze at 400 feet south averaged 11.7 dwts. per ton for a width of 24 inches. A winze at 260 feet south has been sunk 40 feet on the lode, which averaged 15 dwts. per ton for a width of 27 inches.

As regards output, our figures indicate that ore won from the mine was as follows:—

	Tons.	Fine ozs.	Av. value dwts.
1907–1908—Hannans North 4373E and 4374E	1,244	392·72	...
1897–1907	18,219	12,416·89	...
1908–1916—Golden Zone Leases 1694E, 4273E, 4274E, 4380E	44,601	67,607·85	...
Total prior to Gt. Boulder Propty. operations	64,064	80,417·46	25·7
1924–1926—Hannans, North 5350E and 5351E (Gt. Boulder Propty. operations)	8,780	6,258·0	14·2
	72,844	86,675·46	23·8

This mine was operated by the Great Boulder Proprietary G.M. Ltd. from January, 1924, till August, 1926, at which date the mine was closed down. I am indebted to the manager of the above-mentioned mine for the following information concerning their operations:—

Production:
Ore Treated, 8,780 tons.
Value of gold won, £26,731.
Average value extracted, 60s. 11d.

Expenditure	£	s.	d.	Per ton treated. shillings.
Purchase of Leases and Plant	3,000	0	0	6·8
Mine Development ...	11,897	2	4	27·1
Ore Extraction ...	13,839	7	11	31·5
Ore Transport ...	2,201	6	5	5·0
Ore Treatment ...	6,972	9	0	15·9
General Expenses ...	301	19	5	0·7
	£38,212	5	1	87·0
Loss on operations ...	£11,481	0	0	

These figures show that the ore treated was of very satisfactory grade, having an extractable value of 60s. 11d. per ton, to which we might add the residue to arrive at its total value. The expense of working the mine was, however, unusually high. This would seem to have been due principally to the smallness of the lode which not only makes mining costs high, but also makes the cost of developing ore high also. In addition, all the ore had to be carted to the plant at the Great Boulder Mine at a cost of 5s. per ton. If the mine is to be worked again, there will be a heavy development expenditure, inasmuch as the shaft will have to be sunk another lift; another level will have to be driven, and the necessary connections made to the existing bottom level. Unless, therefore, better costs can be obtained than those of the Great Boulder G.M., the mine cannot be profitably re-opened. It may be possible to reduce these costs. A mining cost of 31.5s. per ton seems high even for a comparatively small lode. A certain amount of stoping was done below the bottom level. This was necessarily an expensive method. A development expenditure of 27.1s. per ton of ore treated also seems unduly high. Treatment costs can be reduced if the ore can be treated by the bromo-cyanide process or by flotation, and ore transport could probably be reduced and could be eliminated if a treatment plant were erected at the mine. Still the fact remains that the Great Boulder Company, after purchasing the mine and working it for two and a-half years, abandoned it, and no other company has taken it up again.

The length of the shoot and the grade of the ore are attractive, but it is a mine of which it would be very easy to make a failure, and, failing an improvement either in size or grade, it would require very efficient management to work it profitably. Should, however, the lode fortunately increase a foot or two in width it would become at once a valuable mine.

Suitability for Boring Operations: If the lode is to be tested at a depth of, say, 800 feet, each borehole would require to be 920 feet in length if boring from the surface and depressed at 60 degrees. Such a bore, besides being expensive would, in all probability, deflect from its intended course considerably. A cheaper and more satisfactory method would be to put out an east crosscut at the 600ft. level and put down, say, three depressed boreholes from the ends of the crosscut, as indicated in the sketch, to cut the lode at intervals of 100 feet at a vertical depth of 800 feet. If thought advisable, another crosscut could be put out and three similar boreholes bored from it.

Summary and Conclusion: At the bottom level (600 feet) the assay plan shows a shoot of ore, 600 feet in length, worth an ounce per ton in value and 33 inches in width. The operations of the Great Boulder G.M. produced 8,780 tons of ore having a recoverable value of 60s. 11d. per ton. Their costs were so high that ore of this grade was unprofitable, one of the most serious items being the cost of developing the ore. With good equipment and careful attention to costs, it may be possible to work the mine profitably.

Boring from the surface to cut the lode below the present workings would be very costly, and not very satisfactory owing to the probable deflection of the bores.

A better boring scheme would be three bores from a crosscut put out at the 600ft. level to cut the lode at a vertical depth of 800 feet.

Personally, I hardly think the Government is justified in carrying out this work entirely at their own cost, but think that we might favourably consider a proposal in which a share of the cost is borne by a company prepared to work the mine if the results are sufficiently encouraging.

10.—WOLFRAM AT ORA BANDA.

(22nd November, 1929.)

When at Ora Banda in September, 1929, I took advantage of the opportunity to inspect a Wolfram deposit, on which a little prospecting work had been carried out by Messrs. Ferris, Kearns and Son.

The wolfram occurs in big white quartz reefs, situated about 1½ miles North-East of the old Golden Mount G.M. These quartz reefs are no doubt extremely acid types of pegmatite and the wolfram appeared to be confined to small cross veins, which occur at intervals in the large quartz reefs. The prospectors experience so far has been that the wolfram gives out at quite a shallow depth. A few tons of ore have been collected and it is proposed to crush it at the State Battery, at Coolgardie.

A more or less picked sample of ore was collected and sent to the Government Mineralogist and Analyst for examination. He described it as quartz with wolfram (tungstate of iron and manganese), limonite (hydrous oxide of iron), and a little muscovite mica, ferri-tungstite (basic tungstate of iron), and bismite (bismuth trioxide). The percentage of tungsten trioxide in the picked sample was 9.48 per cent., and he stated that there would be no difficulty in concentrating this to 65 per cent. tungsten trioxide (WO_3).

Crystals of wolfram, an inch or more in length, are common. On present appearances, the deposit is more one of scientific interest than of commercial importance.

11.—PROPOSED BORING AT HILL 60 G.M.L. 1215M—MT. MAGNET.

(18th December, 1929.)

When at Mt. Magnet on the 27th November, I was approached by Mr. W. Clark, one of the owners of the above mentioned mine, who advised me that he was making an application for some boring to be carried out on their mine to prove the value of the lode at a depth. I inspected the mine accordingly and have to report as follows:—

The Ore Body.—A strong jasper bar having a general strike of about 10 degrees west of north practically constitutes the ore body. In general, these jasper bars carry payable gold values only where they have been secondarily enriched by auriferous solutions which have percolated through the shattered portions and deposited their gold contents there, and as the shattering takes place mainly near the surface, this type of lode generally carries payable values for a few hundred feet only. They sometimes produce quite a large tonnage of payable ore nevertheless, as for example, the Mount Morgans G.M.

The Workings.—The main vertical shaft has been sunk in the ore body to a depth of 125 feet, at which depth the lode was reported to be worth 10dwts. to 15dwts. in value over a width of 12 feet. At the 76ft. level, a north drive has been driven 230 feet and the south drive 240 feet. Stoping has been carried out above this level for a length of 390 feet, the approximate width of the lode being 12 feet. Our returns show that the mine has produced 11,517 tons of ore, yielding 5,689.48 fine ounces, or an average recoverable value of 9.8 dwts. per ton.

Bore holes to cut the lode at a depth of, say, 250 feet, would give valuable information regarding the behaviour of the lode at this depth and can be recommended.

While at the mine I marked out two boresites, one 50 feet north of the shaft and the other 130 feet south. Each bore site is 150 feet west of the outcrop of the lode and if depressed at an angle of 61 degrees, is estimated to cut the lode at an underlay depth of 260 feet and to pass through it at a depth of about 282 feet. (See Plan and Sections attached).

12.—BORING AT MEEKATHARRA.

(6th January, 1930.)

Acting upon official instructions, I visited Meekatharra on the 28th November last to mark out on the ground the sites selected on Crown Lands by Mr. Blatchford in February, 1927, and to report on the advisability of boring at additional or alternative sites, possibly on ground at present held, it being borne in mind that while it was previously the policy of the Department to bore as far as possible on Crown Lands, it is now the policy to bore where boring will most likely be successful, preferably, but not necessarily, on Crown lands.

The Nature of the Ore Deposits.—The ore deposits at Meekatharra have been described in some detail by E. de C. Clarke, and his geological plan indicates, in a very striking manner, that the ore bodies and the intrusive quartz porphyry dyke are genetically related.

With the exception of the Prohibition G.M. (Old Queen of the Hills G.M.), which is associated with a jasper bar, almost all the other principal ore bodies are associated with the porphyries, and I have no doubt that the auriferous solutions were given off from the same magmas as formed the porphyries. As the result, we find rich quartz veins in and alongside porphyry dykes and at times portions of a porphyry dyke contain sufficient of these veins to admit of its being mined for ore. When this occurs, the whole of the portion mined is termed lode.

The porphyry dyke of greatest economic importance is that known as Paddy's Flat Porphyry Dyke. The ore bodies which are intimately associated with it includes the following important mines, the outputs of which are given hereunder up to December 31st, 1928:—

Name of Mine.	Tons.	Fine ozs.	Average value, dwts.
Ingliston	21,325	19,947·12	18·7
Ingliston Extended ...	109,769	57,274·44	10·4
Ingliston Consols Extd.	520,528	271,808·16	10·4
Fenian	322,318	273,278·92	17·0
Marmont	55,126	39,906·03	14·5
Gwalia	4,327	9,793·95	45·3
	1,033,393	672,008·62	13·0

The porphyry dyke, known as the Halcyon Porphyry, ranks next in importance. It has been traced with fair certainty for about half-a-mile from the north end of the Commodore G.M.L. to that of the Halcyon Extended Lease. The Commodore G.M. produced 40,527 tons of ore, yielding 16,121.38 fine ounces of gold, or an average of 8 dwts. per ton. The Halcyon Grand produced a further 7,019 tons of ore for 3,142.69 fine ounces, also an average of 8 dwts. per ton. The Pioneer porphyry dyke has associated with it the Pioneer G.M., with an output of 6,995 tons, yielding 6,373.31 fine ounces of gold.

Other dykes have smaller ore bodies associated with them.

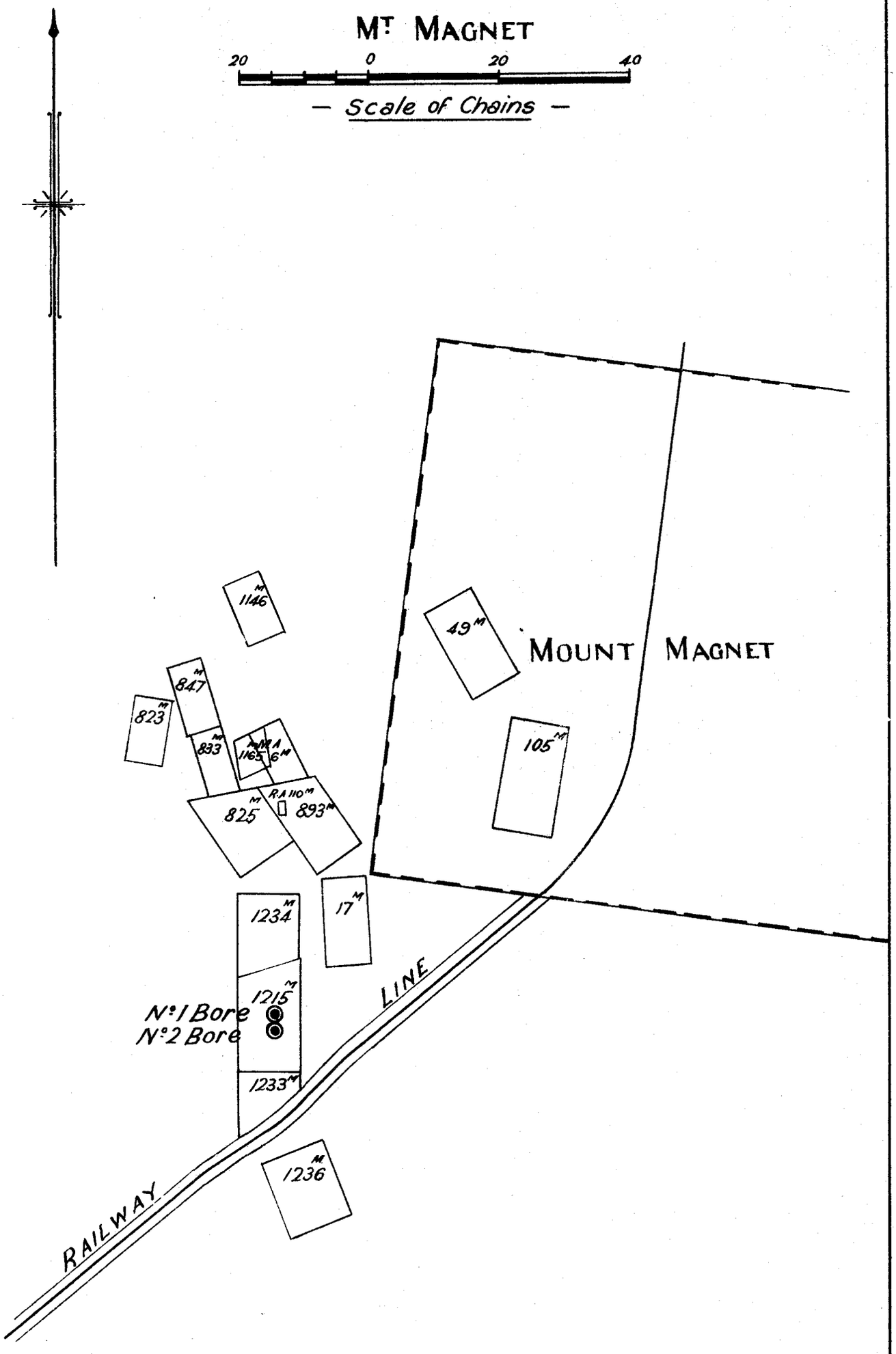
Locality Plan of Bores

"HILL 60" G.M.L. 1215M

Mt MAGNET

20 0 20 40

— Scale of Chains —

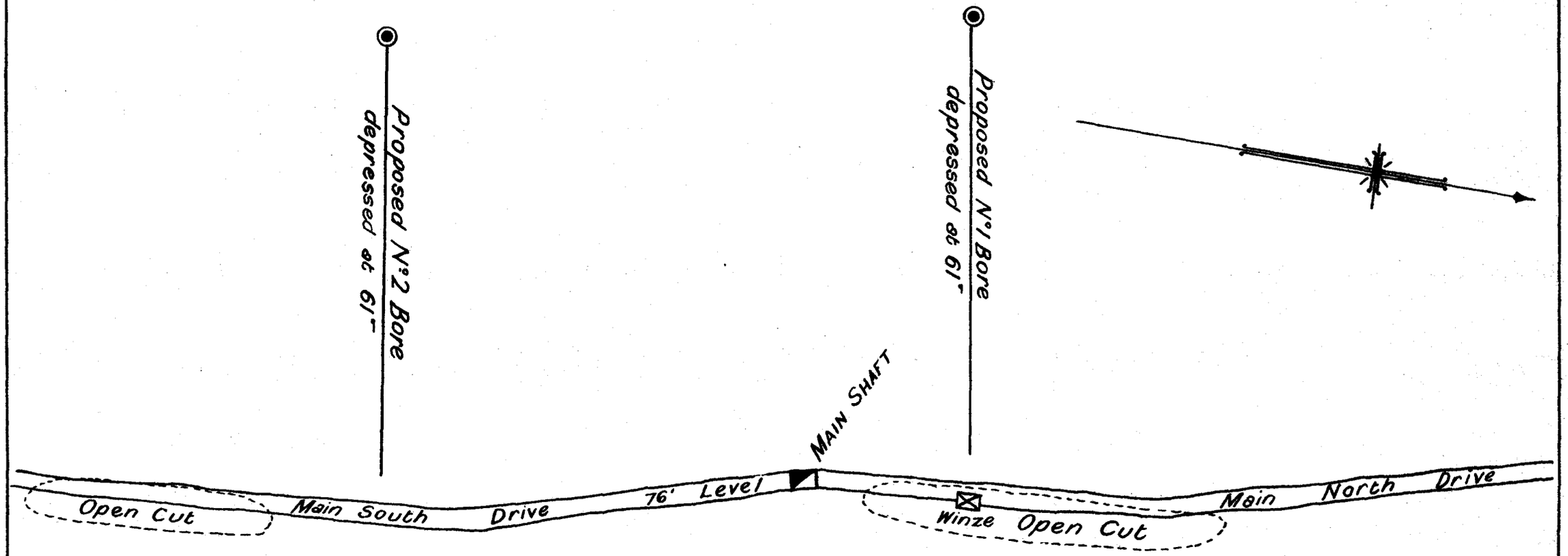


Plan Shewing Bore Sites

"HILL 60" G.M.L. 1215M

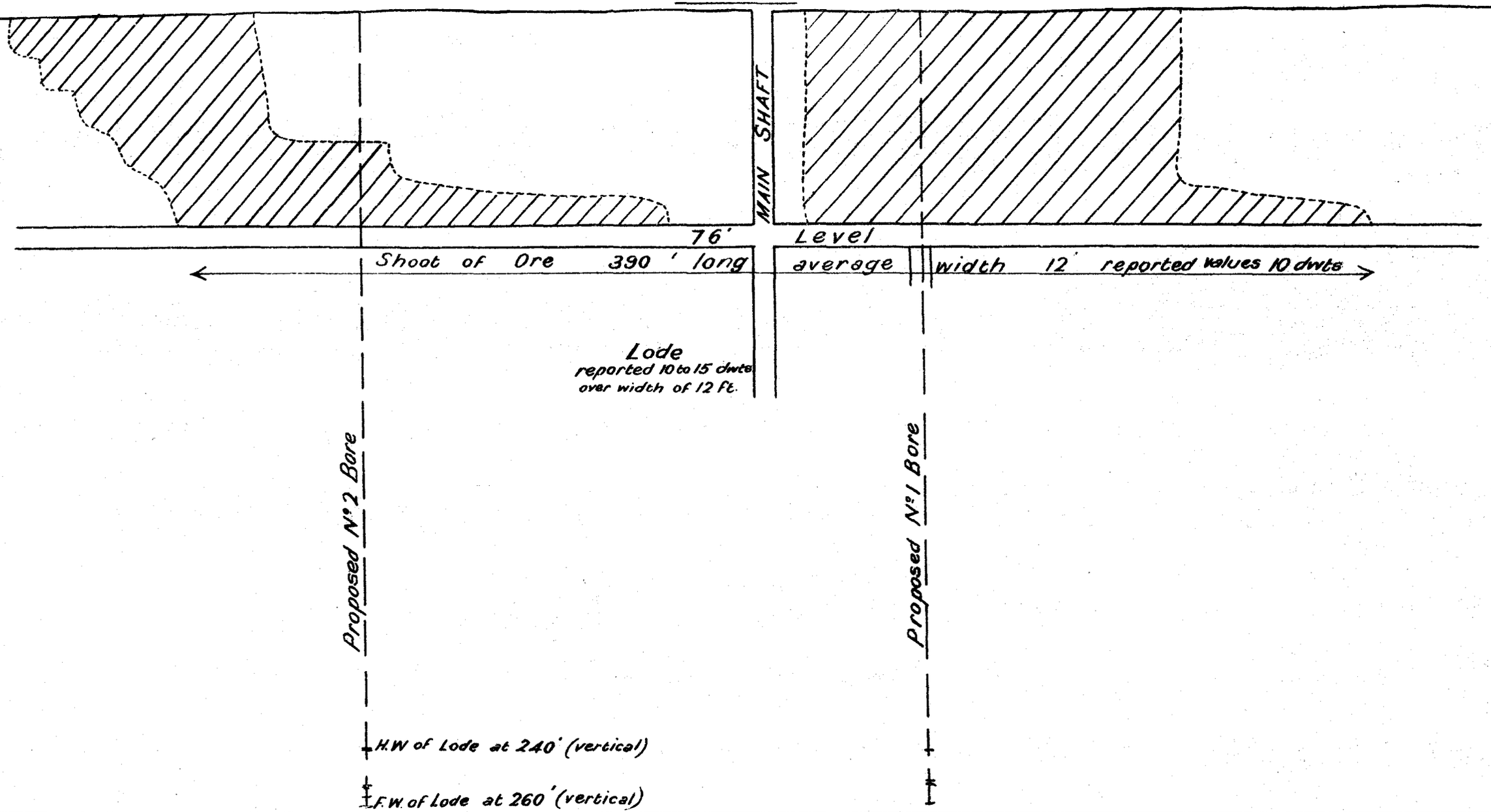
40 0 40 80

– Scale of Feet –



Longitudinal Section
"HILL 60" G.M.L. 1215 M

40 0 40 80
— Scale of Feet —



Mines Operating.—The principal mines at present operating are the Ingliston Consols Extended (which now includes the Fenian G.M.), the Lady Central G.M., and the Prohibition G.M. These will now be briefly described.

Ingliston Consols Extended—Ore body.—The ore body worked in this mine is of the same shoot of ore as was worked in the Fenian and Marmont Mines further south.

Reference to the plan shows that the southern end of the shoot pitches north rapidly with the result that the ore shoot passes out of the Marmont G.M.L. at a depth of a little over 300 feet. The shoot in the Fenian G.M. from this depth gradually shortened, and at the 1,150ft. level there was 100 feet only of the shoot in this Lease.

Clarke considers that the failure of the ore body at the south end is due to the diversion of ascending solutions by the fissures of the S.E. Spur and the No. 2 Marmont Spur, which have thus robbed the main channel.

The northern end of the shoot was worked in the Ingliston Consols Extended G.M.L., and showed no noticeable pitch to the north. In consequence the shoot has shortened progressively with depth.

Clarke draws attention to the importance of the small quartz veins in the lode, as follows:—

In the Ingliston Consols the main lode channel carries very numerous (usually small) quartz veins in which two directions of orientation are said to be recognised. The complicated character of the earlier workings is due to the fact that only the rich quartz veins were then mined. The cross fissures in this mine are numerous and appear particularly in the stopes above the No. 4 level to have thrown the lode west (going north) in a succession of steps. This is the case in which the transverse fissures are later than the longitudinal. Elsewhere in the Ingliston Consols the cross fissures which strike and dip steeply in various directions, generally carry higher grade quartz than the main body but only persist for a short distance outside it.

The lode was worked continuously from the No. 10 level upwards. At the No. 11 level a short shoot of ore only was met with in the Main North Drive, where a series of leaders mostly running east and west improved the value of the porphyry. Elsewhere at this level low values only were met with. A vertical winze, sunk at the south end, was also in low values.

At the No. 12 level a south drive only has been driven. A rich leader was met with near the present face. I understand that elsewhere low values only were obtained.

The Lady Central G.M.Ls. 1547 *and* 1542.—The mine is situated about 20 chains north of the northern boundary of the Ingliston Consols Extended G.M.L. 475N, and the workings are alongside the same porphyry dyke (Paddy's Flat porphyry).

High values have been met with in quartz leaders, principally those running across the porphyry. Three of such quartz veins cross this dyke in such a way as to form the letter "N" on the plan. The middle one of these veins is known as Rinaldi's leader. In addition there are a series of flat leaders, presumably of different age, carrying no values of any consequence. The manager, Mr. R. A. Anderson, pointed out to me that while some of the leaders gave out near the surface (as a rule they were very persistent underfoot), and also appeared to be increasing in numbers as well as in size with depth. A quartz vein at the bottom of the winze below the 160ft. level is 18 inches in width, and carries high values.

Mr. Anderson is hopeful that the size and number of the leaders will continue to increase with depth till a regular ore body can be worked, as was the case at the Ingliston Consols Extended and the Fenian Mines.

I understand that the option holders intend to sink the shaft to 300 feet to test the correctness of this view. Conditions near the surface certainly appear similar to those existing in the big mines. There is, therefore, a reasonable chance that their enterprise may be rewarded.

In addition to the new ground at present being worked, the Leases held by this Company take in the old Ingliston Extended G.M., at which mine reference to the longitudinal section will show that stoping was carried out on an east lode and a west lode, in addition to some stoping on what was known as the Main Spur.

The east lode, which is situated 200 feet east of Paddy's Flat porphyry dyke has been the principal producer. A shoot of ore, 400 feet in length, was worked between the 200ft. level and the surface on the south side of the shaft, and a shoot 200 feet in length was worked on the north side of the shaft down to a depth of 425 feet. According to Clarke this lode is a sheared zone in black schists which has been permeated by gold-bearing solutions. It was known as the Mud Lode owing to the readiness with which the oxidised ore slimed in the battery. Throughout its greater part, this lode lies close to a dolerite dyke. As this dyke is of younger geological age than the lode it might cross the lode, but would not cut it out. In consequence Clarke thought that the Southern Extension of this lode should be looked for, and might be found in the East side of the dolerite dyke.

He states (Geol. Bull. 68, page 149) that:—

"occasional values were obtained in Shaft 4 (637N), in Shaft E (65ft. level), and in Shaft B (44ft. level), in which last place one or two quartz veins were mined up to the edge of the dolerite and where the values are said to have averaged 1 oz. per ton. These may be the southern extension of the East lode, but this part of the belt has yielded little more than 10 tons of ore, and the occurrence can hardly be called important. In the Ingliston United Main Shaft values were obtained on the east edge of the porphyry. It is reported also that a lode formation was cut at the end of the long east crosscut."

Proposed Borehole No. 5 may cut the Southern continuation of this lode in addition to the Ingliston Consols Extended main lode.

The West Lode is described by Clarke as follows (Geol. Bull. 68, page 150):—

This has been followed horizontally for more than 500 feet, and to a depth of more than 400 feet. It dips, sometimes East, sometimes West, at very high angles.

The gold-bearing material is quartz, which follows the Eastern slickensided wall of the porphyry dyke, and varies from a mere "skin" to 3 feet or more in thickness (in which latter case, it has a compound structure). Most of the gold comes from a seam of bluish quartz, seldom more than two inches wide, which lies nearest to the porphyry. Occasionally the vein splits and the two parts may be separated by several feet of country, but reunite lower down.

Near its South end, the upper part of the West Lode has been thrown up and west and removed by denudation. Small irregular veins run along the fault plane, which also cuts through the porphyry.

The Southern continuation has been looked for unsuccessfully in the 210 ft. level and in Shaft III. (881N). The junction of porphyry and fuchsite rock in Shaft III. is of the dovetail type illustrated from the Gwalia Extended and Mickey Doolan Leases. Two crosscuts at the 156ft. level to the west side of the porphyry found no lode matter.

The Main Spur, Clarke describes as follows (Geol. Bull. 68, page 151):—

This body resembles the east ore body of the Commodore G.M. in character. It strikes parallel to the west lode and is almost vertical. It is composed of three feet to six feet or more of very white quartz, in which are embedded large fragments of the surrounding fuchsite country. The main spur is thrown west by the fault already mentioned in connection with the porphyry and west lode and its upper portion is supposed to be the "vertical vein" formerly worked about 40 feet above the 125ft. level, the quartz of which is said to have been very like that of the main spur.

The main spur has yielded a small quantity of ore mainly from a north-pitching shoot which was caused by the junction with the "sub-spur" vein. Values are said to be generally better close to the fuchsite inclusions.

The Prohibition G.M.—This mine was formerly known as the Queen of the Hills, which after producing 117,862 tons of ore, yielding 45,367.26 ozs. fine gold, closed down in 1916.

Recently the mine was re-opened, and is at present being worked under the name of the Prohibition G.M. by a local syndicate, who continued the 160ft. level Main South Drive and drove it 300ft., making a total of about 450ft. No survey of this work has been made, but it would appear that the driving has been done in a South-Easterly direction following the jasper bar with which this ore deposit is associated.

No systematic sampling has been done, but values were met with over a width of approximately 60 feet, and shrink stoping is at present in progress over the hanging and footwall sections of the lode. Each of these stopes is about 20 feet in width, and the middle section of roughly the same width is being left.

The ore is low grade, 8,600 tons having been mined for 1,575.32 fine ozs., or an average recovery of 3.7 dwts. per ton. The mine is very cheaply worked, however, and I was informed that two machine men and one shoveller send up 25 tons of ore a day. This is crushed in a ten-head battery and cyanided. I understand that the mine is just about meeting expenses, which is a very creditable performance on such low grade ore.

The Empire G.M.L. 1534.—This mine is not at present being worked, but was found since Geological Bulletin 68 was published, and is of interest because like a number of the principal mines further North, the workings are alongside the eastern side of Paddy's Flat Porphyry. A rich quartz leader, with a slight inclination to west, was worked for a length of 240 feet and to a depth of 192 feet. It produced 471.75 tons of ore yielding 1,063.12 fine ozs. of gold by amalgamation. In addition 61.88 fine ozs. were obtained by dollying.

I was able to inspect these workings accompanied by the prospector, Mr. Lynch, who informed me that there was a little value in the formation alongside the leader. He said that a sample taken from an East crosscut at the 136ft. level gave an assay value of 3 dwts. per ton over a width of 24 feet.

At a meeting of the Prospectors' Association, which I attended, I was asked to consider the advisability of testing the ground under these workings. It will be noted that this mine is in the vicinity of Mr. Blatchford's No. 2 Bore, but is further west.

Proposed Bore Sites.

Sites selected by Mr. Blatchford—No. 1 Bore.—The bore is situated approximately 1,500 feet south of the Marmont Main Shaft, and is set out to cut the possible line of lode shown on Clarke's Geological Plan at a vertical depth of 350 feet, the bore to be inclined and depressed at an angle of 50 degrees from the horizontal. This bore was marked out on the ground.

No. 2 Bore.—This bore is situated roughly 825 feet south of No. 1 Bore. Like No. 1 Bore it is set out to cut the possible line of lode shown on the Geological Plan at a depth of 350 feet, and is to be depressed at an angle of 50 degrees from the horizontal. This bore has been marked out on the ground.

No. 3 Bore.—This bore is situated approximately 1,020 feet south of No. 2 Bore, and was set out by Mr. Blatchford to cut the possible line of lode at the same depth as No. 1 and No. 2. Reference to my plan shows that the workings are actually further west than they are shown on the Geological Plan, and in consequence if this bore is put down it will have to be moved further west.

Additional or Alternative Bores.—The following sites can be recommended as additional or alternative sites:—

No. 4 Bore.—This bore is situated 250 feet south of the Ingliston Extended Main Shaft, and is laid out to cut the East lode at a vertical depth of 400 feet, the bore to start from the west side of the lode and to be depressed at an angle of 55 degrees from the horizontal as indicated on the plan accompanying this report. This bore has been marked out on the ground. Estimated depth of bore, 480 feet.

No. 5 Bore.—This proposed bore is laid out to cut the Northern extension of the Ingliston Consols Extended Main Lode at a vertical depth of 500 feet, and also possibly to cut the southern extension of the Ingliston Extended East Lode at a vertical depth of perhaps 250 feet, the bore to be bored from the east side of the lode and to be depressed at an angle of 55 degrees (see plan and cross-section). This bore requires to be marked out on the ground. The distances from the lease lines and the bearings are as shown on the plan. Estimated depth of bore, 610 feet.

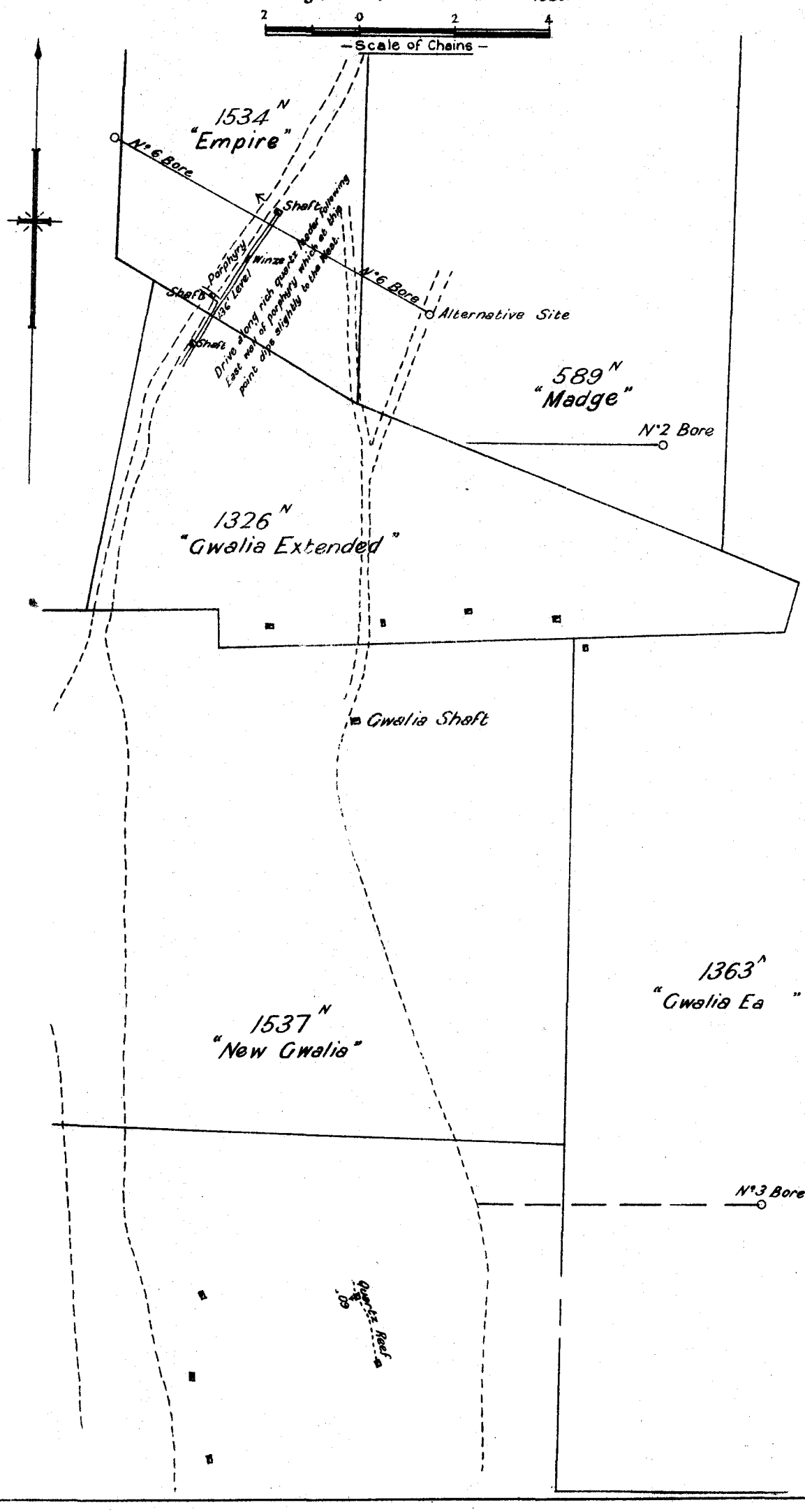
No. 6 Bore.—This proposed bore is situated 21 feet south of the North Shaft at the Empire G.M., the bore is to be started from the west side, and is laid out to cut the lode at a depth of 250 feet. The angle of depression is 48 degrees. This bore was first suggested to me by the members of the Prospectors' Board.

The bore seems to have a chance of success as the conditions here are somewhat similar to those existing near the surface at the large mines further North.

This bore has been marked out on the ground. It was laid out on the west side because the porphyry dyke dips slightly to the west at this point. The bore could be started from the east side, and would show whether or not a possible lode indicated by Clarke exists at this point or not. It would be a little longer, viz., 376 feet as against 333 feet for the bore already marked out. (See sketches attached.)

Another bore which might also receive consideration would be one to prove the southern continuation of the large low grade body at present being worked in the Prohibition G.M. This bore cannot be set out until a survey is made of the 160ft. level.

Locality Plan of Bores
MEEKATHARRA
Shewing Nos 2, 3 and 6 Bore Sites



Locality Plan of Bores

MEEKATHARRA

Shewing Nos 4 & 5 Bores.

2 0 2 4

– Scale of Chains –

1542 N
"Ingliston Alberts"

Proposed N°4 Bore
Depressed at 55°

Estimated Position of 400' Level

1547 N

328 N
"Lady Central"

520 N

1530 N
"United"

Assumed position of lode at 500'

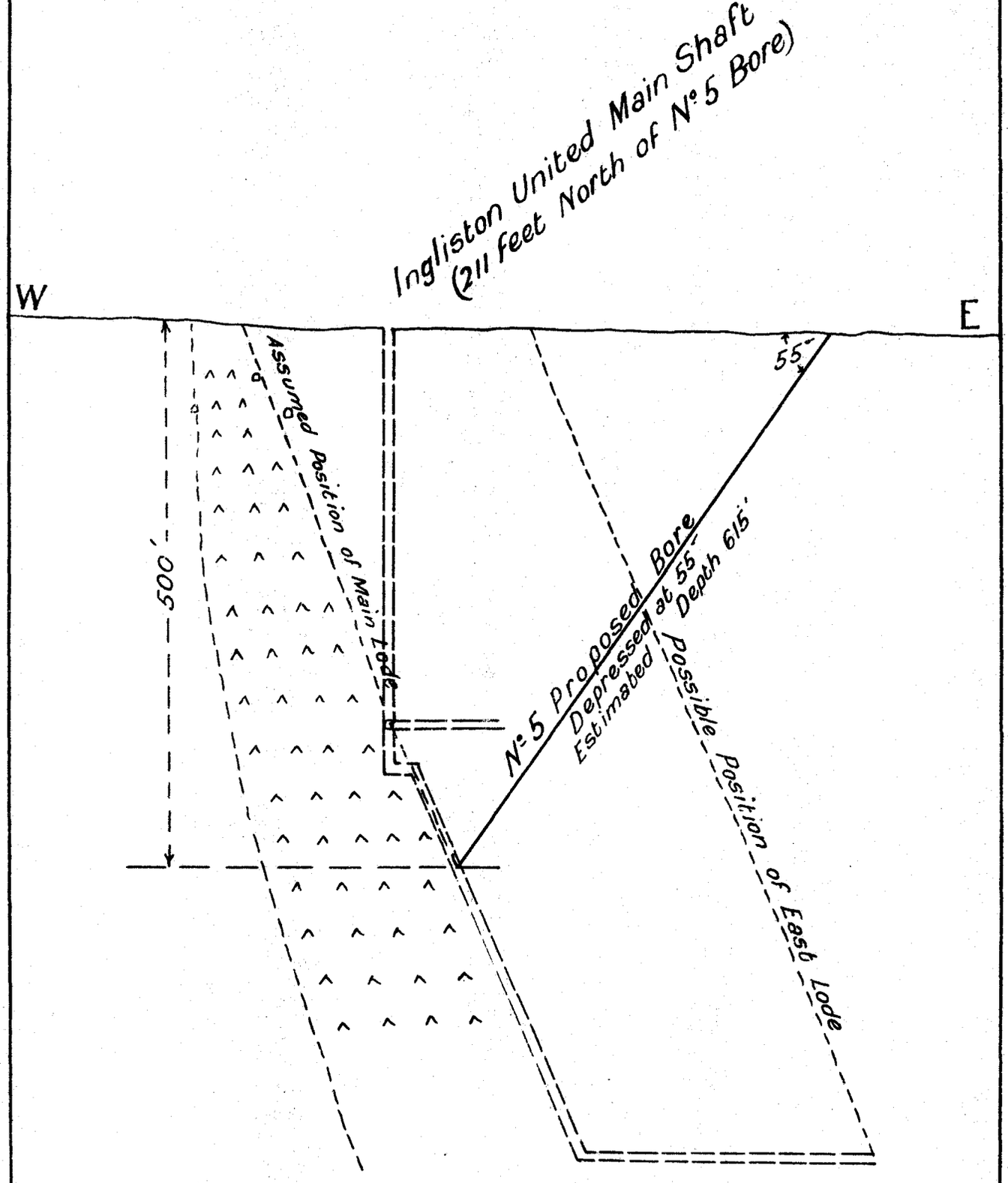
Proposed N°5 Bore

729 N
"Ingliston Consols"

- BORING AT MEEKATHARRA -

- Cross Section at N°5 Bore -

- Scale:- 132 Ft. = 1 In. -



APPENDIX No. II.

MINING DEVELOPMENT EXPENDITURE.

	£	s.	d.
Advances outstanding 31st December, 1929—			
Advances authorised prior to 1929 ...	227,168	7	6
Advances authorised during 1929 ...	5,790	0	0
Total authorised	£232,958	7	6
Principal Moneys Advanced—			
Prior to 1929	202,630	7	2
During 1929	3,780	8	11
	£206,410	16	1
Principal Moneys repaid (including sale of securities)—			
Prior to 1929	34,163	13	5
During 1929	3,904	17	3
	£38,068	10	8
Bad Debts written back and amounts transferred—			
Prior to 1929	16,830	0	9
During 1929	4,831	6	7
	£21,661	7	4

	£	s.	d.
Interest paid prior to 1929	16,192	12	7
Interest paid during 1929	963	19	8
	£17,156	12	3
Interest outstanding at 31st December, 1928	17,479	19	10
Interest outstanding at 31st December, 1929	19,122	13	4
Principal moneys advanced ...	£ 206,410	16	1
Less principal moneys repaid 38,068 10 8			
,, bad debts written off ... 21,661 7 4			
	59,729	18	0
Principal outstanding at 31st December, 1929	146,680	18	1
Interest outstanding at 31st December, 1929	19,122	13	4
Total principal and interest outstanding	£165,803	11	5

APPENDIX No. III.

Annual Report of the Board of Examiners for Colliery Managers' and Under-Managers' Certificates under the "Coal Mines Regulation Act, 1902-1926."

Office of the State Mining Engineer,
Mines Department,
Perth, 23rd January, 1930.

The Under Secretary for Mines, Perth.

Sir,

We submit herewith, for the information of the Hon. Minister for Mines, the Annual Report of the Board of Examiners for the year ended 1929.

Two meetings were held during the year under review: on the 17th April and 30th October, 1929.

Examinations for Certificates.

April Examination.—No applications were received to sit for Second Class Certificates of Competency. There was only one candidate for the examination for First Class Certificate of Competency held at Collie on the 10th, 11th and 12th April, 1929, but the candidate withdrew before the completion of the examination on account of illness.

October Examination.—The examination was held on the 16th and 17th October, there being only one applicant, Mr. F. J. Newburn, who sat for a Second Class Certificate of Competency. His papers and oral examination were very good, and the Board granted him a Second Class Certificate of Competency.

First Class Certificate (without examination).—On the 19th August, Mr. S. Platten made application to be granted a First Class Certificate of Competency on his corresponding English Certificate. His oral examination and papers being very satisfactory, it was resolved by the Board at its meeting in October to grant him a First Class Certificate under the West Australian Act.

At the meeting of the Board in April, at which all members were present, the question was raised as to the relative values of the different subjects. After lengthy discussion, the Board set the possible number of marks for each subject in accordance with the value given to it.

At the same meeting it was resolved that insufficient time was allowed for some of the subjects for First and Second Class examinations, and the time was increased accordingly.

Copies of the papers set for the First Class Examination held in April, and Second Class Examination held in October, are attached to this report.

We have, etc.,

A. M. HOWE,
State Mining Engineer, Chairman.

T. BLATCHFORD,
Government Geologist, Member.

JAS. McVEE,
Inspector of Mines, Collie, Member.

V. RUSSELL,
Secretary.

DEPARTMENT OF MINES.

THE COAL MINES REGULATION ACT, 1902–1926.

EXAMINATION FOR FIRST CLASS CERTIFICATE OF COMPETENCY.

SUBJECT :—ARITHMETIC.

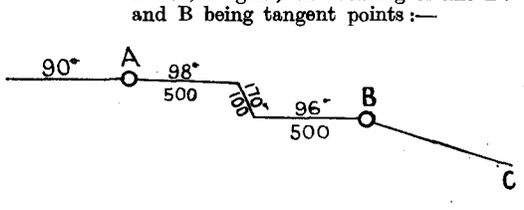
Wednesday, 10th April, 1929, 10 a.m. to 11 a.m.

Possible Marks.		
16.	1.	A total quantity of 259,200 cubic feet of air passes in equal proportions through three return airways to the upcast shaft which is 324 square feet in sectional area. What should be the dimensions of the return airways so that the velocity in each is equal to that in the upcast shaft.
17.	2.	A tunnel 12 feet by 8 feet is driven on the full dip of a coal seam dipping from the outcrop at 45 degrees for a hypothenusal length of 1,500 feet, seam 12 feet thick. The overall cost of driving is £15 per lineal yard, and the coal taken out is sold at 16s. per ton. Compare this in the matter of cost with sinking a vertical shaft to reach the seam at the face of such tunnel, the overall cost of the shaft being £20 per foot. (1 cubic yard equals 1 ton).
17.	3.	A pump in a mine delivers 510 gallons per minute. Owing to a breakdown the pump is idle for four hours. After repairs have been effected, it is necessary to work the pump for twelve hours before the water is reduced to the same level as before the breakdown. What is the feeder of water per minute ?
17.	4.	Two adjacent mines pay coal royalty to a lessor. One has 39 per cent. of smalls, and an allowance of 5 per cent. for dirt. The other has 43 per cent. of smalls, and an allowance of 2 per cent. for dirt. Which mine pays most royalty on a drawing of 1,000 tons ?
17	5.	A, B and C own 100 ten-ton waggons which are let out on hire to several collieries. Each waggon makes three trips weekly and earns at the rate of 6d. per ton carried. If the capital cost is £250 per waggon, what percentage of profit is made ?
16.	6.	A can hew and fill 5 tons of coal daily. B can hew and fill 4½ tons daily. Filling occupies one-fifth of the time. How many days will A and B take to produce 100 tons working conjointly, if a filler is provided ?
100		

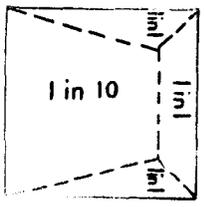
SUBJECT :—SURVEYING.

Wednesday, 10th April, 1929, 11 a.m. to 1 p.m.

Possible Marks.		
20.	1.	It is proposed to put in a curve from A to B on a trial survey. From data on sketch, find radius, tangent, and bearing of line BC—A and B being tangent points :—



Possible Marks.		
10.	2.	Describe your method of laying down this curve on the ground.
20.	3.	In level ground a square excavation is to be made of 100 cubic yards capacity, and it is to be excavated in such a manner that three sides will slope 1 in 1 and the fourth side 1 in 10, the latter to be continued till it meets the opposite side as shown in diagram. What in feet will be the length of the side of the square on the ground surface ?



10.	4.	Describe your method of adjustments of Dumpy level.
10.	5.	Give sample of your method of booking levels and balancing same, say 6 sights.
30.	6.	Three bores are put down on a known coal seam from a level surface 50 feet from each other in the form of an equilateral triangle. Bores are marked A, B, and C. A. bore is 100 feet vertical depth. B. bore is 70 feet vertical depth. C. bore is 60 feet vertical depth. Bearing of A B is 90 degrees. Find the strike and dip of the seam.
100		

SUBJECT :—GEOLOGY.

Wednesday, 10th April, 1929, 2 p.m. to 4 p.m.

Possible Marks.		
25.	1.	Compare the origins of coal seams and mineral oil deposits. What conditions are necessary for both to occur in the same formation ?
25.	2.	What classes of faulting are of frequent occurrence in coal seams ? Describe in detail any instances of faulting you have observed in Collie. Also explain why the Collie measures are surrounded by granite.
25.	3.	What evidences of faulting would you look for if you were in search of a fault at the surface when— (*a.*) there were no outcrops. (*b.*) when outcrops were abundant.
25.	4.	Assuming that two bores have struck the same seam of coal, what further information would you require in order to determine the dip and strike of the coal seam ?
25.	5.	Explain the following terms and their significance in a coal analysis :— B.T.U. ; Calories ; Volatile Hydrocarbons ; Fixed carbon ; Ash.
25.	6.	In what respect is fossil evidence of use in determining the quality of a coal seam ? Describe with sketches the most common types of plant fossils found at Collie.
150		

SUBJECT :—COAL MINES REGULATION ACT, 1902–1926.

Wednesday, 10th April, 1929, 4 p.m. to 5 p.m.

Possible Marks.		
15.	1.	What occurrences require to be reported to an Inspector under the Act ?
15.	2.	It has been decided to enlarge a main haulage road. To do this, explosives have to be used. State fully the precautions necessary to comply with the Coal Mines Regulation Act, 1902–1926.
15.	3.	What does the Act require with regard to— (*a.*) Division of mine into parts. (*b.*) Reporting of accidents.
15.	4.	General Rule 6—"Withdrawal of workmen in case of danger." Name all the dangers possible to occur in a coal mine to which this rule is applicable.
15.	5.	What steps must be taken on the abandonment of a mine ?
15.	6.	State shortly the General Rules relative to the ventilation of a mine and the apparatus for producing it.
90		

SUBJECT :—MACHINERY.

Thursday, 11th April, 1929, 10 a.m. to 1 p.m.

Possible Marks.		
40.	1.	The diameter of a lever safety valve is 3 inches, the length of the lever from fulcrum to valve is 6 inches, the weight of valve is 5lbs., the length of lever from fulcrum to centre of gravity is 15 inches, the weight of lever is 16lbs., and the length of lever is 35 inches. Find pressure of steam required to release the valve with a weight of 60lbs. at end of lever.
30.	2.	What type and class of motor would you advise for a heavy duty haulage plant ? Give your reasons, and state the necessary gear required between the generator and controller operating the motor.
30.	3.	Describe how to fix wire rope conductors and weights in a deep shaft, and state what other precautions are necessary to provide against the cages colliding whilst running in the shaft.
40.	4.	What are the differences between the action of a three-throw ram pump and a centrifugal pump in raising water ? State the good and bad features of each type for use in Collieries.
30.	5.	The time has come for laying off and cleaning one Lancashire boiler in a range. Describe fully the various steps to be taken and things to be done from the time the fires are drawn to the time they are lighted again.
30.	6.	Sketch and name the type of ventilating fan with which you are most conversant, and state the class of engine and drive employed.
40.	7.	The water from the dip workings of a mine is pumped to the surface through a bore hole 400 feet deep which is lined with 10-inch casing. Owing to a serious fracture in the casing which allows 50 per cent. of the water to run back into the mine it is desired to re-line the hole with 8-inch casing lowered inside the 10-inch casing. Explain how to carry out this important work to make a water-tight job.
30.	8.	Haulage conditions underground are favourable to the use of Electric Locomotives. Explain fully the arrangements necessary for the safe working of such locomotives.
30.	9.	Find the B.H.P. of the motor required to drive a pump to deliver 20,000 gallons of water per hour against a head of 1,000 feet.
300		

SUBJECT : MINING OF COAL.

Thursday, 11th April, 1929, 2 p.m. to 5 p.m.

Possible Marks.		
30.	1.	It is intended to make an endless rope jig in a place rising 1 in 27. What mechanical arrangements are necessary ? Electricity and compressed air are available. Make sketch showing full particulars.
30.	2.	What do you understand by panel working ? Describe the system with a sketch. State what are the advantages of this method of working.
30.	3.	When extracting pillars, describe the operation of drawing timber from a finished "lift" and state what precautions you would take in order that the work may be done as safely as possible.
30.	4.	In working a coal seam 6 feet thick, a down-throw fault is met with displacing the seam 120 feet from which about one-half of the coal area has to be worked. Describe in general the arrangements you would make to reach and work this area in a practical and economical manner.
30.	5.	A seam of coal 14 feet thick is to be worked and the utmost amount of coal is to be got. Describe in detail the method of working you would adopt to do this. The seam is prone to spontaneous heating.
30.	6.	Sketch a small district of "bord and pillar" workings in a seam where firedamp is given off showing both "whole" and "broken" and the ventilation.
30.	7.	A fire having broken out near the bottom of a downcast shaft when men are in the workings, state what steps you would take for their safety and rescue.
30.	8.	A seam of coal 8ft. 3in. is to be opened from the outcrop and an output of 1,000 tons in 7 hours is required. Show by sketches how you would lay out the workings and provide for adequate ventilation. Seam dips 1 in 8.
240		

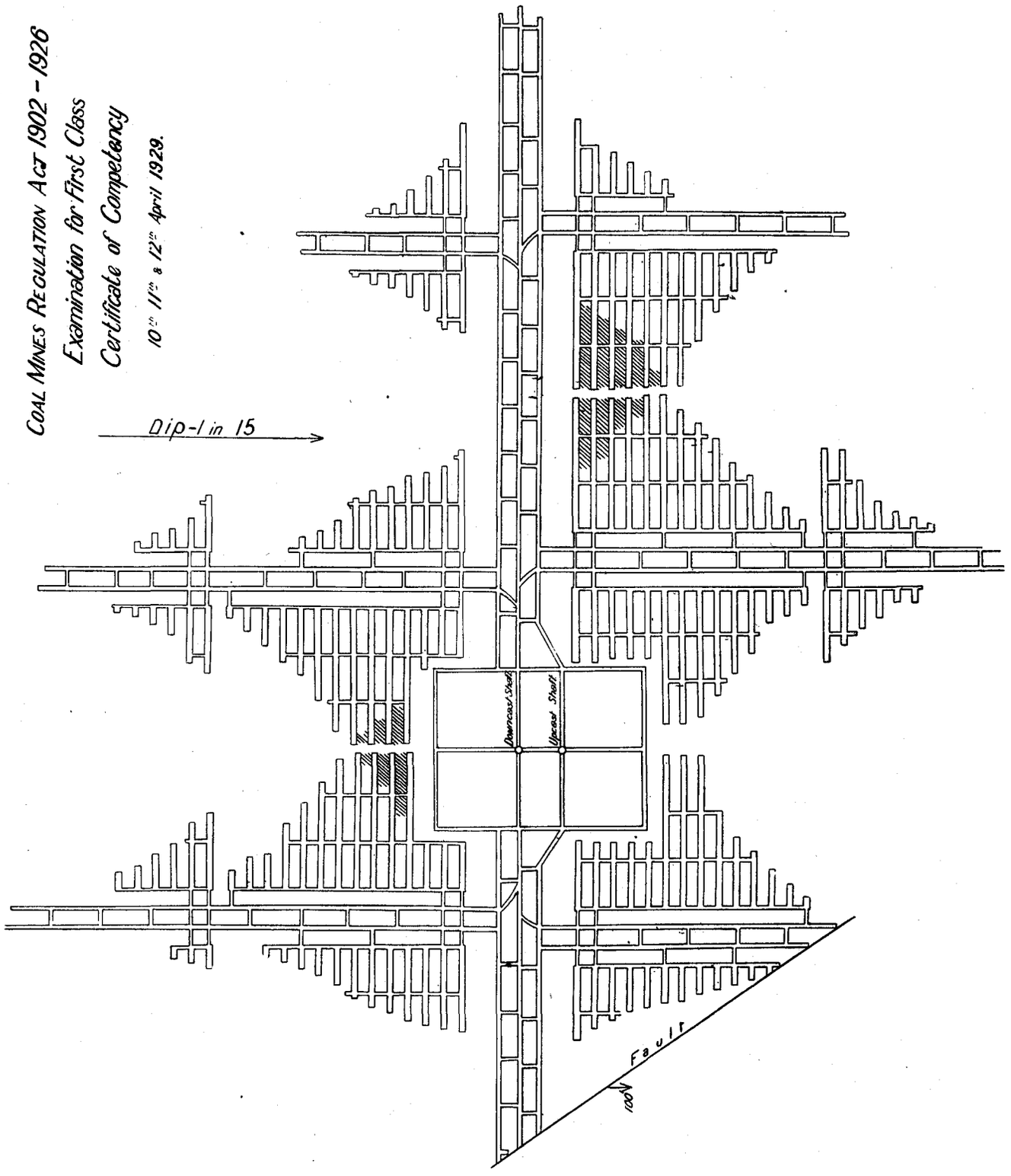
SUBJECT : VENTILATION AND DANGEROUS GASES.

Friday, 12th April, 1929, 10 a.m. to 1 p.m.

Possible Marks.		
30.	1.	One airway is 6 feet by 10 feet, and another is 8 feet by 12 feet. How much greater must be the water gauge in the first case than in the second, if the length of airways and quantity passing be the same in each ?
30.	2.	There are 50,000 cubic feet of air circulating in three splits of a mine in airways of the following dimensions :— (*a.*) 800 yards long 8 feet by 6 feet. (*b.*) 1,200 yards long 9 feet by 5½ feet. (*c.*) 1,500 yards long 7 feet by 6½ feet. What is the quantity in each ?
30.	3.	Give the specific gravity, chemical symbol, and principal characteristics of— (*a.*) Carbonic acid gas. (*b.*) Carbon Monoxide, (*c.*) Sulphuretted Hydrogen, (*d.*) Carburetted Hydrogen.

Possible Marks.		
30.	4.	You are on surface at a Colliery when a serious fire breaks out at the screens near the downcast shaft during the working shift. What steps would you take to secure the safety and rescue of the men underground ?
30.	5.	A mine is to be equipped with 300 safety lamps. State the rules necessary to be adopted for the use and care of the lamp in the following instances :— (*a*) The lamp cabin, (*b*) The lamp station underground, (*c*) By the employees.
150		

Possible Marks.		
30.	6.	Apart from any statutory provisions, how would you satisfy yourself that the ventilation of a district was fully adequate for all likely requirements ?
30.	7.	How is the relative humidity of the air in a mine determined ? What is the practical value of the information thus gained ?
30.	8.	Ventilate the accompanying plan with due regard to haulage, pumping, etc.
240		



EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER MANAGER OR OVERMAN.

SUBJECT: ARITHMETIC.

Wednesday, 16th October, 1929: 9 a.m. to 11 a.m.

Possible Marks.	
17	1. A drowned working is estimated to contain 40 million gallons of water. The feeder in the workings is 200 gallons per minute. How long will a pump raising 950 gallons per minute take to drain the workings if 5 per cent. of the time be lost in stoppages?
17	2. If the royalty on coal worked from 12 acres of a seam of coal 60 inches thick is £2,500, what will be the royalty on 15 acres of a seam 50 inches thick at the same rate per ton?
16	3. In an airway 7ft. 6ins. wide and 6ft. 8ins. high the air is travelling at the rate of 120 feet in 12 seconds. What is the quantity passing per minute?
17	4. Find by practice the cost of 21 acres 3 roods 5 poles at £2 13s. 4d. per acre.
16	5. What is the gross yearly output at a colliery where the boiler consumption is 8,000 tons per annum, and is 6 per cent. of the total output?
17	6. Give the weight of water in a lodgment 40 yards long 8 yards wide and 7 feet deep.
100	

SUBJECT: COAL MINES REGULATION ACT, 1902-1926.

Wednesday, 16th October, 1929: 11 a.m. to 1 p.m.

Possible Marks.	
25	1. What are the stipulations of the Coal Mines Regulation Act concerning the support of roof and sides?
25	2. State the General Rules relative to the ventilation of a mine and the apparatus for producing it.
25	3. What does the Act require relative to— (a) Division of a mine into parts. (b) Reporting of accidents.
25	4. Give the gist of the terms of the General Rule in reference to the inspection of machinery above and below ground, and state by whom and how this is done at the Colliery where you are engaged.
25	5. Give the requirements of the Act in respect to manholes on haulage and horse roads.
25	6. Under what circumstances does it become necessary to withdraw the workmen from a mine or part thereof? If this has to be done, what further steps should be taken?
150	

SUBJECT: ROADWAYS.

Wednesday, 16th October, 1929: 3 p.m. to 5 p.m.

Possible Marks.	
30	1. Sketch in detail the method of laying the rails forming the connection from a dip haulage road into the level. The engine plane dips 1 in 8 and is worked by a single rope. Show the method of putting in the curve, and the necessary pulleys. Should the full skips be on the higher or lower side of the level and why?
30	2. How would you support a haulage road 300 yards long when the sides are good, but when there are 5 feet of bad roof? The road is to be made 12 feet by 6ft. 6ins. in the clear. Give full particulars how to carry out the work.
30	3. As under-manager of a Colliery you have decided to relay one of your main haulage roads during the week-end. Explain fully how you would undertake the work so that the fullest efficiency will be obtained from the men engaged.
30	4. What precautions would you take to guard against accidents by clips slipping, breakage of ropes, etc., with an endless rope haulage up a grade of 1 in 6?
30	5. When making permanent main roadways, what points should be kept in view relative to—(a) haulage, (b) ventilation, and (c) subsequent maintenance?
150	

SUBJECT: MINING OF COAL.

Thursday, 17th October, 1929: 10 a.m. to 1 p.m.

Possible Marks.	
25	1. What points would you consider before adopting one of the following methods of haulage:— (a) Endless rope. (b) Main and tail. (c) Direct haulage.
25	2. State briefly the principal dangers to be met with in the course of shot firing operations, and how they can be reduced to a minimum.
25	3. It is intended to commence a working of pillars, but it is found that the roof is much broken in the bords. Would you clean up the old bords or drive new roadways through the pillars, and why?
25	4. What precautions should be taken to prolong the life of a haulage rope, and if it became necessary to change the rope end for end, how would you proceed to carry out this work?
25	5. A seam of coal 14 feet thick, prone to spontaneous combustion, is to be worked and the utmost amount of coal must be recovered. Give in detail the method of working you would adopt.
25	6. What precautions do you suggest are necessary in dealing with a missed shot that has been attempted to be fired with a detonator and fuse?
25	7. Under what conditions would a syphon assist in draining a mine, and what is the limit at which it will act?
25	8. An old roadway which was driven in solid coal has fallen in closely. It is supposed to lead to workings which contain water, and it is proposed to re-open it. What precautions would you take in doing so?
200	

SUBJECT: VENTILATION AND DANGEROUS GASES.

Thursday, 17th October, 1929: 2 p.m. to 5 p.m.

Possible Marks.	
25	1. What are the conditions which would influence you in deciding whether a mine is or is not adequately ventilated?
25	2. How may a small percentage of CH_4 usually not explosive be rendered so, and how may the spread of an explosion be prevented?
25	3. What is Carbon Monoxide gas? How is it formed, and what are its properties? What effect has this gas on animal life? Is it an inflammable gas, and does it support combustion?
25	4. What are the various means adopted for the ventilation of a single narrow heading driven a distance of, say, 100 yards in front of the workings? Illustrate your answer by means of a sketch.
25	5. What is meant by the term "vitiated" air? What are the causes of vitiated atmosphere in coal mines?
25	6. If an important air door was smashed during working hours in a district where gas was given off, what should be done? What provision could be made to minimise the consequences of an accident to such a door?
25	7. A fan is working at its maximum and is circulating 150,000 cubic feet of air per minute, but the working faces a mile away are only getting 40 per cent. of it. What is the probable trouble and how would you improve matters?
25	8. There is a current of 65,000 cubic feet per minute passing in the return airway of a mine, $3\frac{1}{2}$ per cent. of which is CH_4. How many cubic feet of this gas are being generated in the mine, and what is the total quantity of air in the current?
200	

DIVISION III.

REPORT OF THE INSPECTOR OF STATE BATTERIES.

The Under Secretary for Mines.

For the information of the Hon. Minister I herewith submit my report on the operations of State Batteries for the year ending 31st December, 1929.

The output at State Batteries from inception to the end of 1929 is valued at £6,280,860 from 1,494,603 tons of auriferous ore and 81,567 tons of tin ore.

ORE MILLED.

Excluding Tuckanarra and Linden Batteries, which were leased, sixteen plants were at the disposal of prospectors for public crushing. St. Ives and Mt. Ida crushed no ore, and the remaining fourteen milled 485 parcels aggregating 20,236.5 tons, an average of 44 tons per parcel. The estimated value of the bullion recovered by amalgamation was £72,443.

The tonnage handled shows a big increase on that milled in 1928, when 382 parcels totalling 16,274.75 tons were treated for an estimated recovery by amalgamation of £54,006.

The increases for the year are:—

No. of parcels, 103.
Tonnage, 3,961.85.
Value by amalgamation, £18,437.

Batteries crushing over 1,500 tons for the year were: Coolgardie 5,250.75 tons, Peak Hill 2,278 tons, Cue 1,982.25 tons, Ora Banda 1,875 tons, Warriedar 1,673.75 tons, Norseman 1,515.75 tons.

Cartage Subsidies and Free Crushings under Clause 2.

A very large increase in the tonnage of ore carted to batteries from Mining Tenements more than five miles distant from State Batteries took place, and cartage subsidies amounting to £6,952 8s. were paid on 11,250 tons of ore. This increase is attributable to the policy of the Department in centralising crushing at Coolgardie and Cue, where rail sidings facilitate the delivery of ore, and to the fact that increased attention has been given to new or moribund centres where there are no crushing facilities. This last-mentioned reason is borne out by the increased tonnage crushed under Clause 2 of our regulations permitting holders of maiden ground, or ground which has not been held as a tenement for five years, to crush trial parcels up to 25 tons free. The tonnage so crushed for the year amounts to 1,198½ tons.

Value of Ore Crushed and Amount Paid to Owners.—20,236.5 tons of ore were crushed of an estimated value of £92,594, equal to £4 12s. 1d. per ton, as against £72,313 and £4 8s. 11d. respectively for 1928, when 16,274.75 tons were crushed.

The gross return to owners was £86.356 = 92.9 per cent.

The net return to owners after deducting charges was 72.609 = 78.1 per cent.

The average milling charge was 9s. 5d., and tailing treatment charge 7s., a total charge of 16s. 5d. per ton.

Owners have therefore been paid approximately 93 per cent. of the contents of their ore at an average treatment charge of 16s. 5d. per ton.

Low-grade Rebates.—Under this heading special rebates are allowed to owners who crush ores with a net value of less than 9 dwts. per ton, the total amount allowed during 1929 being £1,110 9s. 7d. This amount is paid from the vote for Development of Mining.

Revenue and Expenditure.—The expenditure on milling was £19,919 16s. 6d., or 19s. 8.23d. per ton, a reduction of 1s. 4.25d. per ton on the previous year's figures.

Milling Revenue.—Including a refund of £1,110 9s. 7d. allowed as low-grade rebates, the revenue from milling was £10,238 8s. 8d., equal to 10s. 1.44d. per ton, an increase of approximately 1s. per ton on the figures for 1928. Considering the large tonnage crushed free, the revenue collected is satisfactory, and the loss of £9,681 7s. 10d. on this section of the treatment is slightly less than in the previous year, when a loss on milling of £9,716 3s. 7d. was made.

TAILING TREATMENT.

11,275 tons were cyanided during the year, compared with 15,474 tons in 1928. This was partly a reflection of the small tonnage milled in 1928 and to the fact that during the last three months of the year our limited staff had a very full milling programme.

Extraction.—Apart from 448 tons of refractory tailing treated at Coolgardie, the average extraction of 82.09 per cent. was good, as it must be borne in mind that we treat a very varied class of ore, some of which would have been declared too refractory to treat a few years ago.

Details of treatment showing Head Values, etc., are shown later.

Expenditure and Cost of Treatment.—The expenditure on tailing treatment was £5,809 3s. 10d., or 10s. 3.64 per ton. This is an increase of 3.15 pence per ton on 1928 cost. Meekatharra 8s. 0.3d., Cue 8s. 1.1d., and Coolgardie 8s. 6.3d. show the best results.

Revenue and Receipts per Ton.—£6,333 1s. 8d. was received as revenue, equal to 11s. 2.80d. per ton, a slight falling-off from that obtained in the previous year, when the revenue per ton was 11s. 9.78d. A profit of £523 17s. 10d. was made.

Tailing produced.—Basing the tailing at 85 per cent. of the ore crushed, State Batteries produced 11,620.25 tons of payable tailing containing 4,484.2 ozs., or 7.716 dwts per ton, and 4,617 tons containing 401.5 ozs., or 1.74 dwts. per ton. The proportion of unpayable tailing is slightly over 28 per cent. of the tonnage produced.

Tailings Treatment showing Values and Details of Extraction for Year ending December 31st, 1929.

Battery.	Tons.	Head Value.	Contents.	Tail.	Contents.	Extractions.
		dwts.	dwts.	dwts.	dwts.	%
Bamboo Creek	540	8·388	226·5	1·694	45·75	79·8
Boogardie	1,586	6·219	493·2	1·332	105·6	78·6
Coolgardie	1,920	4·892	469·7	1·056	101·55	78·8
Cue	1,561	5·639	440·37	1·178	91·94	79·1
Meekatharra	1,610	8·112	653·05	1·504	121·1	81·4
Norseman	1,107	4·728	261·85	1·173	64·95	75·2
Peak Hill	1,063	3·817	202·9	·784	41·85	79·4
Sandstone	522	11·86	309·55	1·568	40·95	86·7
Wiluna	918	21·84	1,002·5	2·468	113·3	88·6
Totals	10,827	7·478	4,059·12	1·342	726·69	82·09
Coolgardie Sulphides	448	9·118	204·25	3·66	82·0	59·8
	11,275	...	4,263·37	...	808·69	...

TIN TREATMENT.

A slight revival at Greenbushes resulted in our Dressing Plant treating 632 loads at a cost of 5s. 2.8d. and a revenue of 3s. 4.7d. per ton respectively.

The loss of £58 5s. 3d., including, as it does, administration charges, is small.

TOTAL TREATMENT.

Including all sections, 32,143.5 tons were handled as against 31,748.75 in 1928. The total revenue received was £16,678 15s. 9d., and expenditure £25,894 11s., showing a loss of £9,215 15s. 3d.

Comparative Synopsis of Results at State Batteries for 12 months ended 31st December, 1928 and 1929.

—	1929.			1928.		
	Tonnage.	Expenditure.	Revenue.	Tonnage.	Expenditure.	Revenue.
Milling	20,236·5	19/8·23	10/1·41	16,274·75	21/0·48	9/1·29
Tailing Treatment ...	11,275	10/3·64	11/2·8	15,474	10/0·49	11/9·79
Tin	632	5/2·8	3/4·7	...	...	...

Receipts and Expenditure.

—	Tonnage.	Expenditure.	Revenue.	Profit.	Loss.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Milling	20,236·5	19,919 16 6	10,238 8 8	...	9,681 7 10
Tailing Treatment	11,275	5,809 3 10	6,333 1 8	523 17 10	...
Tin Treatment	632	165 10 8	107 5 5	...	58 5 3
	32,143·5	25,894 11 0	16,678 15 9	523 17 10	9,739 13 1
				Less Profit ...	523 17 10
				Net Loss ...	£9,215 15 3

POWER COSTS.

Good results have been maintained at most batteries.

The best figures for the different types of Power Plants are as follow:—

		Consumption per H.P.H. lbs.	Cost per H.P.H. pence
Steam Driven ...	Coolgardie ...	10·28	1·08
Charcoal Producer ...	Cue	0·89	0·63
Wood Producer ...	Ora Banda ...	3·56	0·26

It will be seen that the Wood Producer cost at Ora Banda compares very favourably with crude oil engine costs at the coast.

STAFF.

The retirement of Manager D. Moyes from the Ora Banda-Yarri circuit removed from the service of the Department our oldest Manager, who joined the Department in 1903 and served continuously for 26 years. I wish to place on record the Department's appreciation of his ability, tact and loyal service.

Notwithstanding the prospects of increased tonnage being forthcoming, no new appointment was made, Ora Banda being added to the Norseman Circuit in charge of Manager Wann.

The position of Caretaker-Manager, at Mt. Ida was reduced to that of Caretaker and a saving of £150 per year will be made in 1930.

Further economies were made at Head Office by the amalgamation of the work of two clerks.

I wish to thank the staff for their co-operation and effective service and to draw attention to the increased responsibility incurred by the Engineer for State Batteries during my visits to the Fields.

ADMINISTRATION.

Head Office expenditure was £2,564 4s. as against £2,434 2s. 5d. in 1928. This expenditure includes an amount of £432 paid as retiring allowance.

OTHER ACTIVITIES.

No securities of any importance came into the Department's hands during the year, though valuations and sales of plant and material took up a good deal of the staff's time. The total amount received on account of sales was £1,773 6s. 10d.

The arrangement whereby we purchase and forward explosives to the Pilbara Prospector's Association was continued and gelatine, gelignite, caps, and fuse, costing £310 1s. 2d. were forwarded to Marble Bar.

GENERAL REMARKS.

The increase in the ore handled is encouraging. 103 extra parcels containing 3,961.85 tons were milled, yielding £18.432 by amalgamation.

The estimated total value of the ore crushed was £92,954. The recovery amounted to £86,356, or 92.9 per cent. After deducting treatment charges, a net amount of £72,609 was paid to owners, equal to 78.1 per cent. of the value of the ore.

The average charge for milling and cyaniding was 16s. 5d. per ton, and the high net return to owner suggests that our present method of treatment is very effective.

Head Office administration, including purchase of stores, stationery, inspection, etc., increased from £2,434 3s. 5d. in 1928 to £2,564 4s. 1d., or £120 1s. 8d.

As this includes an amount of £432 retiring allowance, the ordinary expenditure has been decreased considerably notwithstanding the increased tonnage treated.

Loan expenditure amounted to £2,334 3s. 10d., including an amount of £1,294 2s. 11d. on the reconstruction of the Marble Bar Battery, where the whole of the buildings had to be pulled down and rebuilt with 3in. pipe uprights. In addition, the old wood frame mill was replaced by the iron-framed one from 20-Mile Sandy, and the wood foundations replaced by concrete. The depredations of white ants, which were responsible for this expenditure, will not cause the Department further concern or expense.

The cost of assistance to State Batteries for the years 1928 and 1929 is as follows:—

	1929.			1928.		
	£	s.	d.	£	s.	d.
Loss on working ..	9,215	15	3	8,363	5	9
Cartage rebates ..	6,952	8	0	3,626	16	2
Low Grade rebates	1,110	9	7	625	0	11
Loan Expenditure (Erection) ..	2,334	3	10	1,236	0	4
	£19,612	16	8	£13,851	3	2

The above expenditure does not include interest on capital account.

This assistance has resulted in the recovery of gold to the value of £86,356, has stimulated the prospecting of new or long abandoned country, as instanced by the large tonnage crushed free on trial parcels, materially assisted rail traffic to Cue and Coolgardie, and has obviated the high capital cost of the erection of further State Batteries.

D. F. BROWNE,
Inspector of State Batteries.

16th April, 1930.

SCHEDULE 1.

Return showing the number of Tons Crushed, Yield by Amalgamation, and Total Value for year ended 31st December, 1929.

Battery.	Tons Crushed.	Gold Yield Bullion.	Yield Value.
		ozs.	£
Bamboo Creek	1,048·5	1,601·40	5,765·04
Boogardie	437·25	899·85	3,239·46
Coolgardie	5,250·75	5,413·35	19,488·06
Cue	1,982·25	2,008·70	7,231·32
Marble Bar	310·5	790·10	2,844·36
Meekatharra	1,418·75	2,587·15	9,313·74
Norseman	1,515·75	882·55	3,177·18
Ora Banda	1,875·00	1,040·99	3,747·76
Payne's Find	772·00	1,303·05	4,690·98
Peak Hill	2,278·00	906·10	3,261·96
Sandstone	791·5	1,376·15	4,954·14
Warriedar	1,673·75	557·70	2,007·72
Wiluna	484·0	519·50	1,870·20
Yarri	108·0	80·42	289·51
Youanme	290·5	156·00	561·60
	20,236·5	20,123·01	72,442·83

SCHEDULE 2.

Return showing the number of Tons crushed, Gold Yield, and Value since Inception to 31st December, 1929.

Battery.	Tons Crushed.	Gold Yield.	Value.
		ozs.	£
Bamboo Creek	14,500·50	25,351·16	91,264·18
Boogardie	74,958·90	55,045·06	199,545·59
Coolgardie	135,571·00	97,213·64	350,022·74
Cue	26,805·00	26,651·70	95,944·31
Darlot	33,210·00	37,637·74	138,928·25
Laverton	19,336·75	21,578·63	78,854·79
Leonora	56,753·45	62,817·90	229,618·76
Linden	19,783·00	22,531·70	81,114·21
Marble Bar	13,952·75	18,639·05	67,100·73
Meekatharra	87,052·75	104,507·31	378,905·70
Mt. Egerton	7,893·25	4,084·86	13,972·32
Mt. Ida	43,846·15	55,092·66	201,635·75
Mt. Keith	9,787·00	8,618·75	31,027·50
Mt. Sir Samuel	9,681·25	7,505·97	27,021·48
Mulline	77,008·45	98,573·64	354,035·25
Niagara	64,866·00	57,770·81	210,163·11
Norseman	71,975·95	79,846·06	290,628·28
Ora Banda	28,806·25	16,301·86	58,690·62
Payne's Find	30,619·25	38,871·41	139,937·07
Peak Hill	33,300·80	28,679·19	104,398·32
Sandstone	78,915·65	81,873·27	294,939·10
Siberia	16,024·00	16,625·59	59,777·45
20-Mile Sandy	12,184·15	19,055·77	68,930·34
St. Ives	9,307·25	6,172·49	22,220·96
Tuckanarra	15,476·85	21,276·06	78,217·53
Warriedar	12,839·75	6,664·40	23,991·22
Wiluna	64,000·75	37,476·12	135,059·20
Yarri	49,797·25	33,207·86	119,548·10
Youanme	35,048·50	11,674·79	42,029·23
Batteries closed	259,629·34	270,313·31	981,998·47
	1,412,931·94	1,371,658·76	4,969,520·56
Wiluna Lode	81,671·75	34,540·18	124,667·40
	1,494,602·69	1,406,198·94	5,094,187·96
Ore Dressing Plant—			
Coolgardie	475·0	...	1,082·94
Tin Plants—		Tons black tin.	
Greenbushes	2,290·25	14·061	...
Plants closed	79,276·75	969·276	...

Milling.

	tons.	ozs.		tons.	ozs.
Up to 1901 (3 years)	68,791	75,553	1915	49,595	39,095
1902	39,517	57,255	1916	47,330	31,734
1903	49,233	58,305	1917	42,947	38,015
1904	71,616	78,309	1918	39,329	33,523
1905	85,018	92,327	1919	40,291	27,027
1906	95,831	94,187	1920	46,494	28,450
1907	95,280	97,962	1921	34,761	24,035
1908	95,624	89,875	1922	35,722	32,736
1909	94,218	83,127	1923	29,715	21,876
1910	89,278	80,074	1924	18,063	18,515
1911	59,373	56,265	1925	18,093	19,300
1912	56,636	53,888	1926	17,104	16,669
1913	60,573	52,515	1927	21,062	18,503
1914	56,570	45,641	1928	16,274	15,001
			1929	20,236	20,123

Sand Treatment.

	Tons.
Up to 1902	29,255
1903	33,369
1904	42,559
1905	54,420
1906	60,422
1907	63,778
1908	62,081
1909	61,265
1910	43,915
1911	27,444
1912	18,599
1913	18,300
1914	6,219

Tailing Treatment.

	Tons.
1913	13,078
1914	32,723
1915	31,887
1916	34,725
1917	24,890
1918	24,364
1919	15,764
1920	15,437
1921	19,763
1922	24,234
1923	14,307
1924	19,767
1925	14,289
1926	16,122
1927	16,915
1928	15,474
1929	11,275

Slime Treatment.

	Tons.		Tons.
Up to 1904	691	1915	3,454
1905	7,028	1916	15,536
1906	...	1917	13,086
1907	8,220	1918	11,892
1908	5,818	1919	12,780
1909	16,848	1920	11,525
1910	28,819	1921	7,370
1911	20,821	1922	7,492
1912	8,085	1923	8,848
1913	6,089	1924	4,615
1914	6,246		

SCHEDULE 3.

Tailing Treatment, 1929.

Battery.	Tons.	Yield.	Value.
		Fine ozs.	£
Bamboo Creek	540	176·57	749·90
Boogardie	1,586	425·43	1,806·80
Coolgardie	2,368	457·20	1,941·73
Cue	1,561	388·67	1,650·67
Meekatharra	1,610	526·29	2,235·17
Norseman	1,107	200·16	850·11
Peak Hill	1,063	167·95	713·29
Sandstone	522	278·78	1,184·00
Wiluna	918	819·36	3,479·87
	11,275	3,440·41	14,611·54

SCHEDULE 4.

Sand and Tailing Treatment from Inception to 31st December, 1929.

Battery.	Tons.	Yield.	Value.
		Fine ozs.	£
Bamboo Creek	119,08	4,631·99	19,686·74
Boogardie	59,070	16,390·79	69,032·61
Burtville	16,788·75	5,464·13	22,793·76
Coolgardie	83,047	13,374·09	56,644·74
Cue	21,840	4,780·93	20,291·92
Laverton	18,016	3,239·29	13,563·90
Leonora	41,313·5	10,026·18	41,817·21
Linden	18,150	6,054·21	25,731·89
Meekatharra	61,484	13,179·99	55,808·70
Mt. Keith	7,053	816·70	3,468·72
Mt. Sir Samuel	5,988	1,367·56	5,809·39
Mulline	44,794·5	12,261·27	49,863·24
Mulwarrie	23,809·25	4,675·53	19,220·11
Niagara	44,828	6,839·37	28,471·79
Norseman	54,967·5	13,027·87	54,627·05
Ora Banda	14,559	3,288·08	13,966·68
Payne's Find	19,497	2,082·51	8,932·86
Peak Hill	6,150	1,436·43	6,100·38
Sandy Creek	11,496·25	3,512·53	14,639·07
Sandstone	53,693	16,172·47	68,409·97
St. Ives	5,918	961·78	4,084·68
Warriedar	9,436	4,096·13	17,396·24
Wiluna	24,424	12,139·71	51,466·30
Yarri	47,555	4,790·81	20,086·57
Youanme	13,602	3,730·98	15,844·76
Batteries closed	148,007·5	26,962·67	111,916·01
	867,395·25	195,304·00	819,675·29

Residue Treatment from Inception to 31st December, 1929.

Battery.	Tons.	Yield.	Value.
		Fine ozs.	£
Linden	670	95·14	349·34
Menzies	24,270	1,579·26	6,679·01
Mulwarrie	4,618	546·85	2,325·02
	29,558	2,221·25	9,353·37

Slimes Treatment from Inception to 31st December, 1929.

Battery.	Tons.	Yield.	Value.
		Fine ozs.	£
Mulwarrie	4,733·5	751·79	3,194·22
Wiluna	96,784·0	37,665·46	159,961·27
Slimes Plants closed	111,196·25	25,088·87	102,110·62
	212,713·75	63,506·12	265,266·11

Tin Residue Treatment from Inception to 31st December, 1929.

	Tons.
Greenbushes, B.E.	315
Greenbushes, Salt Water Gully	1,444
	1,759

SCHEDULE 5.

Return showing Number of Parcels Treated and Tons Crushed at State Batteries for Year 1929.

No. of Parcels Crushed.	Battery.	Tons.	Yield by Amalgamation. Bullion.	Yield by Amalgamation. Fine Gold.	Gross Contents of Tailings. Fine Gold.	Total Contents of Ore. Fine Gold.	Average per ton. Fine Gold.	Gross Value of Ore.
			ozs. dwt. grs.	ozs. dwt. grs.	ozs. dwt. grs.	ozs. dwt. grs.	dwt. grs.	£ s. d.
15	Bamboo Creek	1,048·5	1,601 8 0	1,357 8 14	339 7 0	1,696 15 14	32 8	6 17 6
16	Boogardie	437·25	899 17 0	762 15 4	250 18 8	1,013 13 12	46 8	9 17 0
178	Coolgardie	5,320·75	5,413 7 0	4,588 13 4	992 10 6	5,581 3 10	20 23	4 9 4
41	Cue	1,902·25	2,008 14 0	1,702 13 19	514 7 13	2,217 1 8	23 7	4 19 0
8	Marble Bar	310·5	790 2 0	669 14 14	...	669 14 14	43 3	9 3 3
43	Meekatharra	1,381·75	2,587 3 0	2,193 0 4	406 7 16	2,599 7 20	37 14	8 9 2
32	Norseman	1,515·75	882 11 0	747 18 9	259 7 4	1,007 5 13	13 7	2 15 6
36	Ora Banda	1,875·0	1,041 0 0	882 8 4	376 5 22	1,258 14 2	13 10	2 17 0
6	Payne's Find	772·0	1,303 1 0	1,104 10 19	68 15 23	1,173 6 18	30 9	6 16 7
20	Peak Hill	2,278·0	906 2 0	768 1 4	283 12 14	1,051 13 18	9 5	1 19 2
33	Sandstone	791·5	1,376 3 0	1,166 10 0	503 0 16	1,669 10 16	42 4	8 19 10
28	Warriedar	1,673·75	557 14 0	472 14 14	381 2 16	853 17 6	10 7	2 3 9
19	Wiluna	484·0	519 10 0	440 7 0	328 18 15	769 5 15	31 19	6 15 1
1	Yarri	108·0	80 8 0	68 3 0	29 8 17	97 11 17	18 1	3 16 8
9	Youanme	290·5	156 0 0	132 4 14	92 5 3	224 9 17	15 10	3 5 6
485		20,189·5	20,123 0 0	17,057 3 3	4,826 8 5	21,883 11 8	21 16	4 12 1
	Plus not cleaned up, December, 1929	117·0						
		20,306·5						
	Less not cleaned up, December, 1928	70·0						
		20,236·5						

SCHEDULE 6.

Expenditure from C.R. Vote and Loan Expenditure Fund on Erection of State Batteries for Year 1929, *and Totals since Inception.*

——	From Revenue.	From Loan.
	£ s. d.	£ s. d.
Bamboo Creek	...	282 14 4
Peak Hill	...	334 4 10
Greenbushes	...	33 7 10
Marble Bar	...	1,294 2 11
Wiluna	...	389 13 11
		2,334 3 10
Erection of State Batteries—		
Expenditure to 31st December, 1907	91,981 1 8	...
Loan Expenditure to 31st December, 1928 ...	...	320,584 3 11
	91,981 1 8	322,918 7 9
	£414,899 9 5	

SCHEDULE 7.

Direct Purchase of Tailings for Year 1929.

Battery.	Tons.	Amount.
		£ s. d.
Bamboo Creek	682·5	713 3 6
Boogardie	422·5	690 10 11
Coolgardie	2,908·5	1,651 18 7
Cue	1,473·75	967 2 0
Meekatharra	797	817 10 2
Norseman	1,011·5	364 2 8
Ora Banda	838·25	612 2 7
Peak Hill	1,369·5	301 7 2
Sandstone	551·75	935 2 2
Warriedar	1,116·25	642 15 0
Wiluna	589·75	1,742 19 11
Yarri	91·7	56 3 11
Youanme	246·55	184 7 1
	12,099·5	9,679 5 8

SCHEDULE 7A.

Return showing Tailings payable and unpayable and Gross Contents for 1929.

Battery.	Tailings payable.		Tailings unpayable.		Totals.	
	Tons.	Gross Contents.	Tons.	Gross Contents.	Tons.	Gross Contents.
		ozs. dwt. grs.		ozs. dwt. grs.		ozs. dwt. grs.
Bamboo Creek	683·5	317 13 6	205	21 13 18	888·5	339 7 0
Boogardie	297	249 16 20	10·75	1 1 12	307·75	250 18 8
Coolgardie	3,051·75	887 0 6	1,209	105 10 0	4,260·75	992 10 6
Cue	1,459·5	500 9 1	156·5	13 18 12	1,616	514 7 13
Marble Bar	213·75	54 19 0	50	4 7 12	263·75	59 6 12
Meekatharra	823	386 16 7	273	19 11 9	1,096	406 7 16
Norseman	1,106·5	244 16 16	164·5	14 10 12	1,271	259 7 4
Ora Banda	834·5	314 16 19	757·5	61 9 3	1,592	376 5 22
Payne's Find	...	...	655·75	68 15 23	655·75	68 15 23
Peak Hill	578·25	215 12 19	857·75	67 19 19	1,436	283 12 14
Sandstone	655	501 1 0	17	1 19 16	672	503 0 16
Warriedar	1,161·75	360 10 2	260·25	20 12 14	1,422	381 2 16
Wiluna	411·5	328 18 15	...	...	411·5	328 18 15
Yarri	91·75	29 8 17	...	...	91·75	29 8 17
Youanme	252·5	92 5 3	...	...	252·5	92 5 3
	11,620·25	4,484 4 11	4,617	401 10 6	16,237·25	4,885 14 17

SCHEDULE 8.

Statement of Receipts and Expenditure for the Year ended 31st December, 1929.

MILLING AND TIN.

Plant.	Tonnage.	Management.	Wages.	Stores.	Total Working Expenditure.	Cost per ton.	Repairs and Renewals.	Sundries.	Gross Expenditure.	Cost per ton.	Receipts.	Revenue per ton.	Profit.	Loss.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	1,048·5	182 3 3	664 1 10	324 2 5	1,170 7 6	22 3·8	61 18 11	256 5 3	1,488 6 8	28 4·5	530 6 9	10 1·4	...	957 19 11
Boogardie	437·25	168 4 7	197 1 2	91 4 5	456 10 2	20 10·5	42 6 1	52 12 4	551 8 7	25 2·6	212 19 9	9 8·9	...	338 8 10
Coolgordie	5,250·75	346 11 10	1,301 13 2	780 6 11	2,428 11 11	9 3·0	111 11 9	612 12 4	3,152 16 0	12 1·0	2,306 7 0	8 9·4	...	846 9 0
Cue	1,982·25	339 9 4	856 3 2	447 11 1	1,643 3 7	16 6·9	101 0 1	230 5 3	1,974 8 11	19 11·0	942 10 6	9 6·1	...	1,031 18 5
Leonora	...	...	...	...	...	...	...	1 5 0	1 5 0	...	51 18 2	...	50 13 2	...
Linden	...	...	...	36 6 0	36 6 0	...	...	...	36 6 0	...	8 16 0	...	...	27 10 0
Marble Bar	310·5	172 18 4	217 12 2	119 9 11	510 0 5	32 10·2	34 2 11	181 9 8	725 13 0	46 8·8	149 2 3	9 7·2	...	576 10 9
Meekatharra	1,418·75	188 14 3	693 6 8	359 3 1	1,241 4 0	17 5·9	163 3 9	208 0 11	1,612 8 8	22 8·7	660 13 6	9 3·7	...	951 15 2
Mt. Ida	...	264 13 3	...	...	264 13 3	...	...	...	264 13 3	...	...	...	...	264 13 3
Mt. Sir Samuel	...	...	...	...	...	...	...	...	...	...	1 0 0	...	1 0 0	...
Mulline	...	...	...	...	...	...	...	...	...	...	7 18 9	...	7 18 9	...
Norseman	1,515·75	314 10 11	681 15 4	273 4 5	1,269 10 8	16 9·0	209 11 4	204 4 1	1,683 6 1	22 2·5	667 13 3	8 5·8	...	1,015 12 10
Ora Banda	1,875·0	485 2 2	1,224 4 1	209 9 6	1,918 15 9	20 5·5	94 13 0	220 7 10	2,233 16 7	23 9·9	1,721 9 2	18 4·3	...	512 7 5
Payne's Find	772·0	78 11 10	413 10 11	182 0 6	674 3 3	17 5·5	44 4 5	121 19 10	840 7 6	21 9·2	405 6 0	10 6·0	...	435 1 6
Peak Hill	2,278·0	143 12 5	745 1 0	291 15 1	1,180 8 6	10 4·3	89 12 11	218 2 11	1,488 4 4	13 0·7	1,018 11 8	8 11·3	...	469 12 8
Sandstone	791·5	146 11 8	436 5 10	220 8 1	803 5 7	20 3·5	147 17 11	146 5 4	1,097 8 10	27 8·7	367 7 4	9 3·3	...	730 1 6
St. Ives	...	...	52 3 1	...	52 3 1	...	...	...	52 3 1	...	3 8 8	...	...	48 14 5
Tuckanarra	...	...	...	...	...	...	...	...	...	...	2 10 0	...	2 10 0	...
Warriedar	1,673·75	125 16 2	637 1 9	280 11 7	1,043 9 6	12 5·6	125 10 7	172 4 5	1,341 4 6	16 0·3	766 6 4	9 1·8	...	574 18 2
Wiluna	484·0	150 15 1	188 0 5	171 17 8	510 13 2	21 1·2	125 9 3	221 18 9	858 1 2	35 5·4	240 13 10	9 11·3	...	617 7 4
Yarri	108·0	21 7 3	120 9 4	33 15 2	175 11 9	32 6·1	9 0 0	32 6 6	216 18 3	40 2·0	72 0 0	13 3·9	...	144 18 3
Youanme	290·5	39 3 3	111 16 7	65 6 7	216 6 5	14 10·7	25 16 4	58 17 4	301 0 1	20 8·6	101 9 9	6 11·8	...	199 10 4
	20,236·5	3,168 5 7	8,540 6 6	3,886 12 5	15,595 4 6	15 4·94	1,385 14 3	2,938 17 9	19,919 16 6	19 8·23	10,238 8 8	10 1·41	62 1 11	9,743 9 9
Greenbushes	632·0	12 9 9	112 4 3	37 16 8	162 10 8	5 1·7	...	3 0 0	165 10 8	5 2·8	107 5 5	3 4·7	...	58 5 3
	20,868·5	3,180 15 4	8,652 10 9	3,924 9 1	15,757 15 2	15 1·22	1,385 14 3	2,941 17 9	20,085 7 2	19 2·97	10,345 14 1	9 10·96	62 1 11	9,801 15 0

SCHEDULE 9.

Statement of Receipts and Expenditure for Year ended 31st December, 1929.

TAILING.

Plant.	Tonnage.	Management.	Wages.	Assays.	Stores.	Total Working Expenses.	Cost per ton.	Repairs and Renewals.	Sundries.	Gross Expenditure.	Per ton.	Receipts.	Revenue per ton.	Profit.	Loss.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	540	49 17 10	222 0 0	21 1 3	57 11 7	350 10 8	12 11·7	3 11 0	20 0 7	374 2 3	13 10·2	176 0 6	6 6·2	...	198 1 9
Boogardie	1,586	60 12 2	328 1 9	51 17 3	215 16 7	656 7 9	8 3·3	66 3 8	206 5 1	928 16 6	11 8·5	990 3 10	12 5·8	61 7 4	...
Coolgardie	2,368	86 13 2	495 4 0	34 12 6	182 16 6	799 6 2	6 9·0	32 16 0	177 11 1	1,009 13 3	8 6·3	862 1 3	7 3·3	...	147 12 0
Cue	1,561	93 15 5	283 11 7	16 14 10	102 11 6	496 13 4	6 4·3	1 15 0	133 8 0	631 16 4	8 1·1	974 19 4	12 5·9	343 3 0	...
Meekatharra	1,610	60 10 0	369 12 3	21 1 10	103 8 1	554 12 2	6 10·6	18 18 0	72 16 3	646 6 5	8 0·3	902 16 2	11 2·5	256 9 9	...
Norseman	1,107	118 13 11	327 4 9	19 8 1	103 13 7	569 0 4	10 3·3	15 18 1	152 8 8	737 7 1	13 3·8	506 6 6	9 1·7	...	231 0 7
Peak Hill	1,063	46 5 10	255 17 6	14 16 3	76 2 2	393 1 9	7 4·7	32 10 5	52 12 11	478 5 1	8 11·9	376 3 9	7 0·9	...	102 1 4
Sandstone	522	32 12 10	140 7 9	2 2 7	51 8 9	226 11 11	8 8·1	...	72 14 0	299 5 11	11 5·5	350 0 0	13 4·9	50 14 1	...
Warriedar	...	...	...	...	...	...	...	...	0 5 6	0 5 6	...	...	...	...	0 5 6
Wiluna	918	94 19 3	262 2 10	29 13 10	131 17 4	518 13 3	11 3·5	15 10 8	169 1 7	703 5 6	15 3·8	1,157 8 0	25 2·5	454 2 6	...
Revenue Suspense Account ...	...	...	...	...	...	...	...	...	...	...	...	37 2 4	...	37 2 4	...
	11,275	644 0 5	2,684 2 5	211 8 5	1,025 6 1	4,564 17 4	8 1·15	187 2 10	1,057 3 8	5,809 3 10	10 3·64	6,333 1 8	11 · 2·8	1,202 19 0	679 1 2

SCHEDULE 10.

Working Profit and Loss Account for Year ended 31st December, 1929.

To Working Expenditure:	£ s. d.	By Revenue:	£ s. d.
Batteries and Tin Plants	20,085 7 2	Batteries and Tin Plants	10,345 14 1
Tailing Plants	5,809 3 10	Tailing Plants	6,333 1 8
		„ Loss on year's operations	9,215 15 3
	£25,894 11 0		£25,894 11 0

SCHEDULE 11.

State Battery Statistics from Inception to 31st December, 1929.

Year.	Milling.				Sand and Tailing Treatment.				Slime Treatment.				Tin Treatment.				Gross Loss. ‡
	Tons.	Expenditure per ton.	Revenue per ton.	Loss.	Tons.	Expenditure per ton.	Revenue per ton.	Profit.	Tons.	Expenditure per ton.	Revenue per ton.	Loss.	Tons.	Expenditure per ton.	Revenue per ton.	Loss.	
		s. d.	s. d.	£		s. d.	s. d.	£		s. d.	s. d.	£		s. d.	s. d.	£	£
1899 ...	18,806	...	...	2,827	...	...	...	...	...	...	...	...	...	...	...	...	2,827
1900 ...	22,675	22 10·1	17 4·5	7,611	...	...	...	...	...	...	...	...	...	...	...	...	7,611
1901 ...	26,775	18 0·0	16 6·0	1,983	9,534	16 9	...	1,337	...	...	...	...	...	...	...	...	646
1902 ...	39,516	14 8·6	14 8·2	169	9,721	22 3	...	724	...	...	...	...	1,170	12 2	...	286	†269
1903 ...	49,233	13 6·8	12 10·6	1,250	33,369	7 7	...	1,442	...	...	...	...	2,009	8 2	...	153	†2,539
1904 ...	71,616	14 4·4	12 6·5	6,423	43,251	7 10	...	1,448	...	...	...	...	2,337	8 2	...	165	5,141
1905 ...	85,018	12 4·0	12 2·5	957	54,420	7 3	9 8·5	6,689	7,028	12 1	...	410	3,697	5 8	5 0·3	324	†3,342
1906 ...	95,831	12 2·0	11 3·8	4,076	65,159	7 4	9 2·1	5,549	4,737	11 8	12 1·1	†2,254	11,428	4 2	4 3·3	†156	†2,880
1907 ...	95,280	12 6·0	11 4·8	8,724	64,514	6 8·7	9 2·8	6,474	8,220	8 7·6	13 5·5	†1,983	10,496	4 4·4	4 8·8	†191	1,688
1908 ...	95,628	12 1·9	9 3·6	13,669	62,272	6 4·7	8 11·0	8,017	5,818	12 0·9	11 8·0	120	5,573	4 5·2	3 6·3	254	7,278
1909 ...	94,218	11 1·7	9 6·6	7,568	61,032	6 5·8	8 9·7	7,096	16,848	10 0·7	9 6·7	423	5,043	4 8·2	3 7·5	267	1,965
1910 ...	89,278	11 3·3	9 6·6	7,709	43,391	6 2·9	8 6·1	4,903	28,600	8 9·1	9 11·5	†1,723	3,769	5 5·5	3 4·1	401	2,365
1911 ...	59,373	12 6·9	9 10·3	8,058	27,362	6 5·9	8 9·7	3,173	28,183	10 10·5	9 5·3	1,666	6,061	4 0·3	3 4·9	188	7,490
1912 ...	56,636	12 9·2	9 8·7	8,616	18,600	8 3·5	8 8·6	397	8,085	11 8·6	10 5·2	519	5,330	4 5·1	3 7·6	210	9,786
1913 ...	60,573	12 5·6	9 5·4	9,155	31,378*	7 5·0	9 5·2	3,160	6,089	12 4·1	9 6·1	862	8,032	5 5·1	4 1·7	513	7,711
1914 ...	56,570	12 6·8	9 2·9	9,413	38,942	6 6·5	8 2·2	3,202	6,246	10 10·2	9 0·0	578	3,340	7 10·6	4 6·6	557	7,418
1915 ...	49,595	11 10·7	9 2·6	6,642	31,887	6 9·3	8 0·6	2,041	3,454	12 6·2	9 10·1	462	1,767	8 1·2	3 11·7	364	5,415
1916 ...	47,304	12 6·7	9 1·9	8,018	35,665	7 1·7	8 7·3	2,510	15,536	8 8·2	8 7·3	56	943	11 11·6	4 0·3	374	5,982
1917 ...	42,947	12 1·5	9 0·0	6,714	24,674	8 3·3	8 10·3	727	15,408	9 8·5	8 3·1	1,104	1,118	11 2·9	3 8·2	422	7,554
1918 ...	39,330	13 2·9	8 11·4	8,442	24,364	8 3·7	9 5·7	1,420	11,892	9 4·8	7 9·0	982	5,985	4 10·2	3 0·2	558	8,650
1919 ...	40,290¾	12 4·1	8 2·0	8,426	15,764	9 2·4	9 3·8	91	12,780	9 1·1	7 4·6	1,089	1,204	10 0·9	3 11·2	369	9,925
1920 ...	46,494¼	12 6·4	7 11·5	8,954	15,437	9 0·4	13 4·1	3,325	11,525	9 11·2	8 8·4	713	737	8 11·2	9 3·3	†12	6,363
1921 ...	34,761	17 3·8	9 0·7	14,361	19,763	10 0·8	17 10·0	7,677	7,370	10 11·6	8 5·7	918	54	82 0·5	8 0·4	200	7,802
1922 ...	35,722	16 11·8	9 2·3	13,862	24,234	9 11·7	15 8·9	6,988	7,492	11 10·5	8 5·8	1,271	...	...	...	55	8,200
1923 ...	29,714	17 0·4	9 6·8	11,044	14,307	11 5·5	14 2·1	1,943	8,848	11 1·3	8 11·7	945	...	...	...	26	10,072
1924 ...	18,063	21 0·1	10 9·5	9,231	19,767	10 8·6	10 7·8	§69	4,615	12 4·1	8 7·6	854	392	13 4·8	3 7·7	192	10,346
1925 ...	18,361¼	22 7·4	10 8·5	10,768	14,289	11 6·6	16 2·1	3,301	...	...	...	...	268	12 6·5	3 8·6	118	7,585
1926 ...	17,104½	23 9·3	9 7·5	12,113	16,122	11 5·7	13 8·2	1,780	...	...	...	...	...	...	...	46	10,379
1927 ...	21,062¼	20 2·1	10 2·0	10,543	16,915	10 2·0	12 8·4	2,135	...	...	...	...	207	9 6·3	4 3·1	54	8,462
1928 ...	16,274¾	21 0·4	9 1·2	9,716	15,474	10 0·4	11 9·7	1,373	...	...	...	...	...	...	...	20	8,363
1929 ...	20,236½	19 8·2	10 1·4	9,681	11,275	10 3·6	11 2·8	524	...	...	...	...	632	5 2·8	3 4·7	58	9,216

* Tailing Treatment commenced 1913. † Profit. ‡ Details of Ore Dressing and Residue Treatment not shown, but financial result included in the figure of this column. § Loss.

DIVISION IV.

ANNUAL PROGRESS REPORT

of the

GEOLOGICAL SURVEY

for the

YEAR 1929.

TABLE OF CONTENTS.

Annual Report of the Geological Survey for the Year 1929.

I have the honour to submit for the information of the Hon. the Minister for Mines my report on the work of this branch of the Department of Mines for the year 1929.

STAFF.

Early in the year the junior assistant Geologist, Mr. K. J. Finucane, severed his connection with the Department to take a more lucrative position on the Tasmanian Geological Survey. Later in the year his position was filled by Mr. F. G. Forman, another graduate in Science from the University of W.A. Otherwise there has been no change in the personnel of the Staff.

FIELD WORK.

Government Geologist.—In addition to ordinary office routine, I was able to make the following field inspections:—

1. An investigation, with Mr. R. L. Jack, deputy Government Geologist of South Australia, of the surface water problems in connection with the 3,500 Farm Scheme of the southern area.
2. An investigation into the occurrence of foul air in the Coronation or Moondyne Cave at Margaret River.
3. The sampling and estimation of the Manganese Ore in the Southern Series of the Horseshoe Deposits at Peak Hill.
4. An investigation of the occurrence of bitumen on Cheyne Beach.
5. Two conferences at Northampton with Mr. Ferguson, the controller of the Geophysical Survey, of the lead deposits of that district.
6. An inspection of a reported tin discovery near Mt. Dockrell in the East Kimberley Division.
7. An inspection of the oil bore at Poole Range in connection with the cementing off of the water from the oil sands at a vertical depth of 2,085 feet.
8. An inspection of a coal discovery at Nannup on the Busselton-Bridgetown Railway.

In addition to the above field inspections two papers were compiled, one a memorandum on the Gold Resources of W.A. for the International Geological Congress XVth Session, South Africa, 1929; and in conjunction with Professor E. deC. Clarke a description and classification of the Pre-Cambrian Rocks of the State, made at the request of the Interstate Geological Conference held in Adelaide in May, 1928.

As it has been decided to cease boring, at least temporarily, for coal at Eradu, a report has been compiled of the work completed to date, with the object of setting out all the data obtained during the two boring campaigns undertaken to investigate the coal seams of that area.

Accompanying this report are a block isometric plan and two sections prepared by Mr. F. G. Forman, a general surface plan showing the relative position of the various bores, and a plan of the bores showing thickness of coal seams with their reduced levels.

Field Geologists.—For the greater portion of the year the assistant Field Geologists were engaged on the underground survey of the Boulder Belt. In addition and in company with Dr. Woolnough, Mr. Feldtmann visited and reported on the Wooramel Area, in connection with the occurrence of mineral oil in that locality. Owing to an urgent request from the management of the Great Boulder Perseverance Mines, Mr. Finucane made a survey of the East Boundary Lode to locate the position between the 1,300 and 1,750ft. levels, and the Australia East Lode at and below the 1,750ft. level. Mr. F. G. Forman has presented a short paper comparing the structural conditions of the Fitzroy Basin with those of some typical noted oil fields in America, based on his personal observations of the latter.

PETROLOGY.

During the year Dr. Larcombe has petrologically examined cores from the bores sunk on the following mines:—

Big Bell, Braeside Mineral Belt, Mararoa South, Prophecy, Kitchener, Carbine, Little Bell, and Enterprise.

In addition numerous rocks have been sectioned both for Departmental officers and the public.

The full reports, together with petrological descriptions of the bore cores, etc., except in such cases when the investigation has been made for purely departmental reasons, will be found in the following pages.

In conclusion I desire to express my appreciation of the work and loyal support of my staff during the past year.

T. BLATCHFORD, B.A.,
Government Geologist.

25th February, 1930.

INVESTIGATION OF THE SURFACE WATER PROBLEMS IN CONNECTION WITH THE SOUTHERN AREA OF THE 3,500 FARMS SCHEME.

T. Blatchford, B.A., Government Geologist.

In company with Dr. Jack this investigation, which has been carried out over the Northern area in the previous year, was continued to the Southern area.

The data collected on this trip only confirmed the opinion previously formed, viz., that fresh surface waters would only be found when coming from granite or hard catchments and then at no great distance from their crests.

Positive evidence of cyclic salt accumulation was obtained particularly in one instance, where the rain water caught in a depression on the top of a granite outcrop, and which had no overflow even after heavy rains, had accumulated sufficient salt to turn it into a dense brine. This pool of water, known as the Basin, occurs three miles east of the 90-mile post on the No. 1 Rabbit-proof Fence.

There seems to be little or no hope but that the farms throughout this area will be dependent on surface catchment water, except when situated close to granite outcrops and in rare cases where there is a gradual fall from high ground with an impervious bottom.

INSPECTION OF THE MOONDYNE CAVE RELATIVE TO FOUL AIR OCCURRENCE IN THE LOWEST CHAMBER.

T. Blatchford, B.A., Government Geologist.

In company with the three cave guides, Messrs. Dawson, Connelly and Brennan, I inspected the Moondyne (Coronation) Cave to investigate the reported occurrence of foul air in the bottom of the cave.

The air from the entrance of the cave down through the various chambers, following the course which visitors take, was found to be quite fresh, in so far that no inconvenience was felt by any member of the party, neither was the flame of the candle noticeably affected. On the bottom floor, however. the conditions of the air were very different and a lighted candle, when lowered to within a few inches of the actual floor of the cave, was quickly extinguished.

I did not realise the presence of impure air until walking round with the guides for a few minutes, when an effect approaching giddiness was experienced and it was then that a candle would burn freely almost anywhere. It was evident that the layer of foul air diffused and when inhaled, caused very slight giddiness, though the dilution was so great that the air would not affect a naked candle. On this account samples were not collected at the time, but Guide Brennan on two subsequent visits filled the retainers, analyses of the gas collected being as on the attached report.

From these analyses it is evident that poisonous gas does occur in the Moondyne Cave and that care must therefore be exercised when showing visitors through the cave. If the precautions which have been practised in the past are continued (the guide descends with a naked candle first and notes the effect), there should be no real danger in allowing visitors to pass through quickly. Careful inspection of the lowest chamber by the guide. however, should be insisted upon and the stay of visitors in the bottom section of the cave should be made as short as possible.

To obviate the presence of the noxious gas more circulation is necessary. This could be effected by laying a 6 to 8 inch pipe from the entrance to the bottom floor or drill a six-inch hole from the surface to the roof of the bottom cave and connect to the floor with a short pipe. As the cave is a very beautiful example of cave formation, it would be regrettable to lay an unsightly pipe throughout the interior, which would not be so effective as a shorter vertical bore. If a light portable boring plant could be obtained it would not cost much to punch a six-inch hole about 150 feet in length, for the country rock would be relatively soft, dry and easy to bore. In this case the exact position of the bore, however, should be fixed by accurate survey so as not to risk destroying a valuable cave formation. If pipes are to be used the length necessary to work round corners, etc., should be obtained from the guides themselves, who know best what they require.

Copy of Assay Certificate 423/29.

Lab. Nos. 1299 and 1300.

Summary of Analysis:

	Sample collected 14th Feb., 1929.	Sample collected 3rd Mar., 1929.
	per cent.	per cent.
Carbon dioxide ..	6.06	2.77
Oxygen	13.64	17.58
Nitrogen (by difference)	80.30	79.65

Owing to the bottles being wet the carbon dioxide originally present in the gas may have been slightly higher than the above figures indicate.

The air collected on the 14th February is distinctly asphyxiating and may cause serious symptoms in man. A recent (1927) authority states:

> When the oxygen of the inspired air is diminished from the normal 21 per cent. to values between 16 and 12 per cent., the first perceptible signs of anoxemia* develop. . . . When the oxygen is diminished to values between 14 and 9 per cent. the higher centres of the brain are affected.

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

REPORT ON THE HORSESHOE MANGANESE DEPOSIT.

By T. Blatchford, B.A., Government Geologist.

I have the honour to submit for the information of the Council of Industrial Development the results of my sampling of the southern series of the two Manganese deposits situated at Horseshoe, in the Peak Hill Goldfield. Unfortunately the original intention of sampling both deposits was not adhered to, the men sinking the sample holes being paid off even before all the necessary holes had been completed on the southern series.

Locality and Communication.—The Horsehoe Manganese deposits are situated about 16 miles by road north-west from Peak Hill townsite, 85 miles by rail north of Meekatharra, and 16 miles north-east, in a direct line, from Mount Fraser.

Geology.—Both deposits occur in Pre-Cambrian sediments. These old beds have, in the vicinity of Horseshoe, a strike varying from north 25-45 degrees east, with a very steep dip to the north-west. The beds have been subjected to considerable stresses and chemical alterations, which have produced folding, variations in depth, and probably shearing or crushing along lines, which strike more or less east and west across the general strike.

*Lack of sufficient oxygen in the blood.

The beds consist essentially of argillaceous material so altered at the surface to preclude a definite classification. Other beds are highly siliceous and occur as quartzites. These beds were probably laid down originally as sandstone.

Quartz veins are not uncommon, and lenses of manganese, iron ores, and mixtures of both are quite frequent and may be seen outcropping at irregular intervals for considerable distances. Similar occurrences have been noted at Mount Fraser in the Teano Ranges and in lesser quantities in many of the beds of this series.

Manganese Deposits.—In dealing with the genesis of the manganese deposits Mr. Montgomery writes as follows:—

> One cannot be very certain of a theory of the formation of these deposits until they have been cut into by mining work so as to give good sections for examination, but at present the most likely explanation appears to be that the ore-bodies follow the general line of some sort of a fracture of the country across its stratification, along which strong lode-forming action has gone on with alteration of the rock to more or less pure oxide of manganese, and in some places to brown oxide of iron. Towards the west end there were possibly several such lines of fracture and mineralisation. From these lode-like bodies there has later on been a great deal of superficial depositions of manganese ore forming thick sheets of secondary manganese over what was the surface of the ground at the time of their formation. The deposits could therefore be regarded as a general crust of manganese oxide over the areas shown on the map, with an unknown number of veins going down into the ground below the crust, and doubtless carrying manganese oxide to some considerable depth.
>
> The main part of the deposit, however, gives the impression of being a superficial deposit, probably formed similarly to some of the lateritic iron ores. It is very dense, clean, black oxide of manganese, and in places shows a brecciated structure, especially along the edges of the portions of the ore body which show lode characteristics.

The sample holes recently sunk on the southern series, and which were not seen by Mr. Montgomery, throw considerable light on the origin, and in my opinion have proved without much doubt that there has been a higher concentration of the mineral contents of the original sediments in a series of parallel lenses where they cross an east and west crushed or shear zone, and that the outcrops of these lenses subsequently, on weathering, produced talus, which on spreading over the surface became partly recemented by circulating solutions and partly, possibly, by laterisation.

The main evidences in support of the above, which the sample holes have exposed, are the following:—

a. High-grade manganese ore gradually changing to one in which iron predominates. This is typical of managanese lodes.

b. High-grade manganese ore suddenly cutting out and found lying on barren schist—signifying that the ore has rolled over from a rich outcrop to cover barren ground.

c. Boulders of rich and low-grade ore mixed and lying on barren ground—a mixture of the talus from two lenses. On one occasion the boulders (60C) were rounded and worn down to a comparatively uniform size appoximating that of a cricket ball.

d. Layers of waste rock are frequently found in the deposit and fine earthy waste separating boulders of ore is extremely common.

e. Some of the sample holes continued in more or less solid ore for over 20 feet, low-grade ferro-manganese ore still remaining in the bottom of the hole, indicative of a lens or lode. In other holes the ore cut completely out at depths of a few inches with no sign of lode material below.

f. Bands of low-grade ore are occasionally found overlying ore of much higher grade, the latter resting on barren ground—distinct evidence of talus action.

The evidence in favour of an east and west shear zone is the undoubted local enrichment in both deposits, the unusual extent of the deposits, and the general layout of the ore bodies.

Numerous lenses of ore can be found by following along the strike of the country, but there are so few deposits of any extent that the concentration must be due to some local cause. Furthermore, where the underlying rock is exposed, as in the cutting for the ore bins, there is distinct evidence of crushing and folding.

From a commercial point of view the chief factor to be considered is the irregular nature of the manganese values, which naturally infers difficulties in sampling, in higher costs for recovering and in grading the ore, and reduction in tonnage.

Sampling.—On my first visit to the Horseshoe I found that the whole of the southern deposit had been laid out by the company's surveyor into chain squares, and that several sample holes had already been sunk at irregular intervals, also that Mr. Elliot was conducting a sampling campaign for the Broken Hill Proprietary. By mutual consent we arranged that the subsequent shafts should be sunk in some order, and as far as possible at definite intervals. It was also agreed on that all holes should be continued until country rock or low-grade ferro-manganese ore was reached, and in the latter case drill holes should be pushed down further into the bottoms to avoid any possibility of misjudgment.

As Mr. Elliot was doing his field analyses from day to day, his results were most helpful in determining when to cease sinking. Unfortunately some of the holes were not completed and holes are still lacking on part of sections 60, 59, 68, and 73 and the eastern section of the deposit lying to the east of section 102. The surface indications of this narrow portion of the deposit are not at all encouraging, and except for a limited tonnage at the extreme eastern end there does not appear to be much ore of considerable value.

Generally speaking my samples were broken in three-foot sections and from the opposite sides sampled by Mr. Elliot with the object of obtaining a closer average value. A slight difference in depth of the trial holes is due to the slope of the hill on which the excavations have been made. This will account, no doubt, largely for minor discrepancies between individual samples. The average for any particular hole, however, will be found to correspond quite closely enough for all practical purposes. In breaking the samples any obvious waste or low-grade ore was not touched but recorded as closely as possible as waste, either by measurement in the holes themselves or the proportions as dumped at the surface. The foreman helped us much in this respect by instructing the miners during shaft sinking to separate the ore, both in filling the buckets and dumping.

It is obvious, however, that the estimates of waste are approximate but should be within, say, 5 to 8 per cent. of the true value.

Estimation of Ore Reserves.—As far as possible the ore has been graded into groups where the predominating manganese values are over 50 per cent., under 50 per cent. and over 45 per cent., and under 45 per cent. and over 40 per cent. Ore below 40 per cent. has not been estimated for reasons which will be explained later.

The areas embracing these grades of ore were calculated with a planimeter and the analyses reduced to foot values.

One ton was allowed for every 10 cubic feet of unbroken ore. This may appear low, but judging from the way the ore breaks on firing, considerable waste must be incurred. In working out the gross tonnages, allowance has been made for the percentage of waste.

The boundaries of the various groups must be considered as more or less tentative, but in the aggregate the tonnages called for should work out satisfactorily. It must be realised, however, that there is no hard and fast line of demarcation in values in any portion of the deposit or in any of the groups. One group, however, will probably support the other when the ore is broken and graded.

Ore containing less than 40 per cent. manganese has not been estimated for the following reasons. This class of ore is as far as can be seen very variable in depth, waste and quality; and a considerable further number of sample holes would be necessary and many of the present holes would require sinking further before even an approximate estimate of the tonnage of ore of that grade could be made. I do not consider there is any probability of exporting ore of this grade, for it is too high in manganese for a ferro-manganese ore and too low in manganese-contents to be classed as a manganese ore. Furthermore, the lower the grade of manganese apparently the more mixed with waste becomes the ore, which would undoubtedly increase the mining costs.

A reference to the plan attached shows clearly that the higher grade ore extends from section 101 westward through the deposit, the area (2) occurring in sections 82, 87, 93 and 101 containing the highest values.

A smaller area (3) contains equally high values with corresponding values buried below much lower values in area (II.). On the flanks of the cut forming the bins in section 26 a small amount of high-grade ore has been developed, but the tonnage is so limited that it has no bearing on a general scheme of expenditure.

Of the second grade (45 to 50 per cent.) the estimates of areas (5) and (7) are fairly certain, but there is a doubt as regards area (8) on account of the lack of at least two or more sampling shafts; which, unfortunately, though marked on the ground, were not started. The tonnage estimated for this area has been based on the holes in 58A and 81C which for safety sake was then reduced 30 per cent., pending a completion of the necessary sampling.

Of the third grade there is not much necessity for comment. The tonnage is not great in any area and the waste is much greater than in the higher grade ores, making this grade very doubtful as to its commercial value.

With regard to the outside areas containing ore under 40 per cent. manganese sufficient has already been written—such ore may be treated for the present as valueless. I concur with Mr. Montgomery in his estimates of the ore east of section 101, and regard that portion of the deposit as practically worthless, except in the extreme eastern end where there may be some 15,000 tons of fairly high-grade ore. As no holes were put down in this section I prefer not to quote figures either as to values or quantities.

The following is the estimation of ore reserves worked out as the result of the sampling:—

Grade.	Area.	Tons.	Mn.	MnO_2.	Fe.	SiO_2.	Waste.	Averages.					
								Tons.	Mn.	MnO_2.	Fe.	SiO_2.	Waste.
Over 50 %	1	450	51·13	73·37	8·94	0·35	5	81,000	50·7	73·3	6·3	0·98	12·3
	2	67,243	50·90	73·10	6·1	0·97	12	...	...	...	...	...	...
	3	12,248	51·08	74·7	7·54	1·9	14	...	...	...	...	...	...
	4	800	50·77	...	...	...	25	...	...	...	...	...	...
45% to 50%	5	20,644	48·08	71·9	8·4	1·11	10	55,000	46·4	69·8	9·7	1·4	15·2
	6	2,937	47·00	71·5	10·6	1·42	*nil*	...	...	...	...	...	...
	7	31,605	45·00	68·0	10·5	1·6	20	...	...	...	...	...	...
	8*	28,000	45·1	67·0	9·0	1·5	20	28,000	45·1	67·0	9·0	1·5	20·0
40% to 45%	9	15,253	39·3	...	22·01	2·5	30	66,000	42·0	...	14·4	2·4	34·5
	10	20,000	41·6	...	18·9	3·6	50	...	...	...	...	...	...
	11	31,000	43·4	...	7·65	1·5	33	...	...	...	...	...	...

* Owing to the incomplete sampling of this area the tonnages quoted must be regarded only as probable ore.

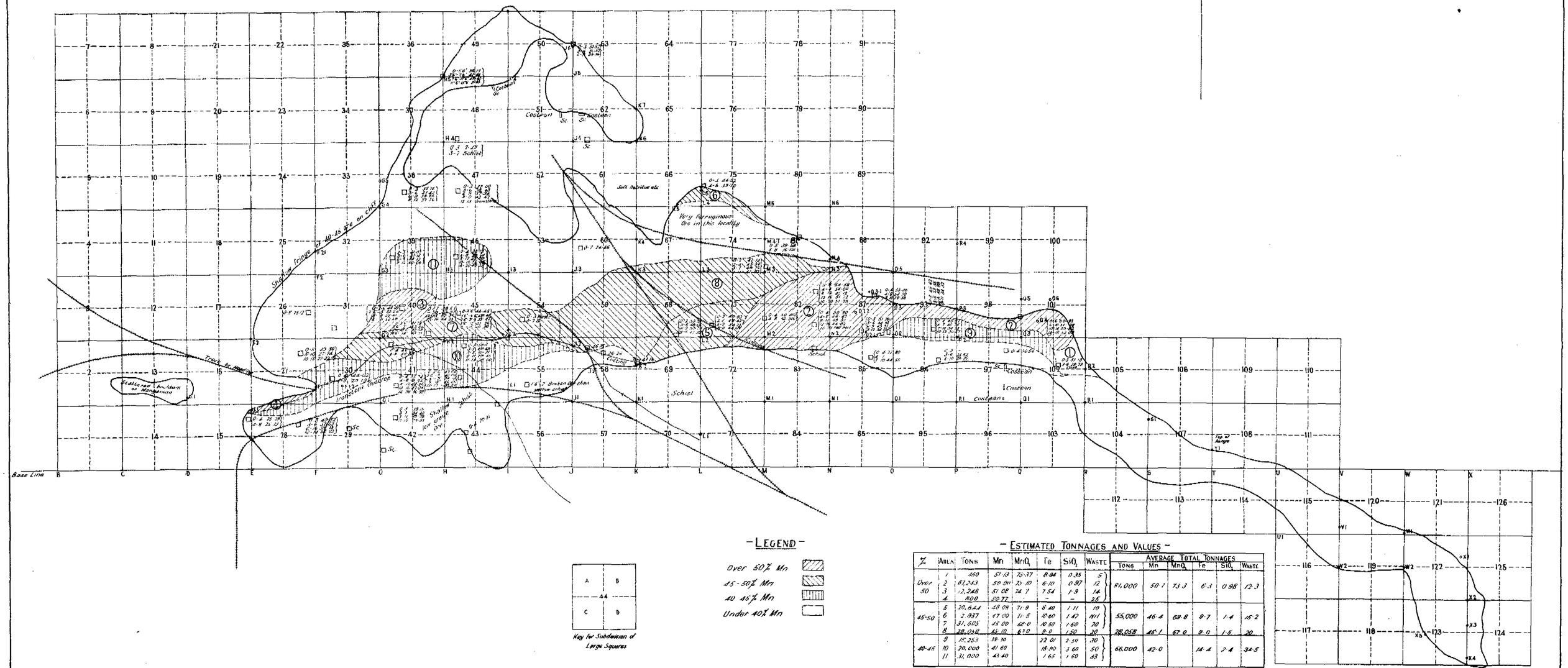
Marketing and Market Prices of Manganese Ore.—There are two distinct classes of marketable manganese ore—Chemical and Metallurgical. Unfortunately there is no very definite standard for either class, variations in specifications occurring from time to time to meet the requirements of supply and demand.

Generally speaking chemical ore is used only in the manufacture of oxygen, chlorine, bromine, and disinfectants; as a decolouriser of glass, in calico printing and dyeing; in colouring glass, pottery and brick; as a drier in paints and paint pigments; as a depolariser in dry batteries, and in the manufacture of drugs and chemicals.

Nº 1 Manganese Deposit

Horseshoe, Peak Hill G. F

Scale of Chains



Legend

- Over 50% Mn
- 45-50% Mn
- 40-45% Mn
- Under 40% Mn

Estimated Tonnages and Values

%	Area	Tons	Mn	MnO	Fe	SiO	Waste	Average Total Tonnages Tons	Mn	MnO	Fe	SiO	Waste
Over 50	1	450	51.63	73.37	8.94	0.35	5	61,000	50.1	73.3	6.3	0.98	12.3
	2	61,243	50.09	73.10	6.10	0.97	12						
	3	12,248	51.08	74.7	7.54	1.5	14						
	4	800	50.72	-	-	-	25						
45-50	5	20,644	48.09	71.9	8.40	1.11	10	55,000	46.4	69.8	9.7	1.4	15.2
	6	2,937	47.20	71.5	10.60	1.42	10.1						
	7	31,925	45.09	62.0	10.50	1.60	20						
	8	28,058	45.10	67.0	9.0	1.50	20	28,058	45.1	67.0	9.0	1.5	20
40-45	9	15,253	39.10		22.01	2.30	30	66,000	42.0		14.4	2.4	34.5
	10	20,000	41.60		18.90	3.60	50						
	11	31,000	43.40		1.65	1.50	53						

The chief qualifications for chemical manganese is an ore containing a high percentage of oxygen and not more than one per cent. of iron. A low percentage of lime is also necessary.

Ore high in lime, low in oxygen, phosphorus and silica is classed as furnace or metallurgical ore, provided the manganese content is capable of producing 80 per cent. ferro-manganese.

The following specifications from various buyers have been kindly supplied to me by the Secretary of the W.A. Manganese Company:—

Keely & Tennant, Jersey City—

First Grade:

MnO_2—87 per cent. or better.
Fe_2O_3—under 1 per cent.
Copper—under 1 per cent.

Second Grade:

MnO_2—75 per cent.
Fe_2O_5—2 per cent.
Copper—0.05 per cent.

Harshun, Fuller & Godwin—

MnO_2—85 per cent.
Iron—under 1 per cent.

This firm is buying Caucasian ore of 87 per cent. MnO_2 and 0.58 per cent. Iron.

Metal & Thermit Corporation—

Manganese—56 per cent.
Iron—1 per cent. (max.).
Silica—1 to 1.4 per cent.
Phosphorus—0.02.
Sulphur—0.02.
Copper and other metals—nil.

Foote Mineral Company—

MnO_2—85.88.
Iron—1.25.
Copper—0.03.

Writing in 1925 Spurr and Wormser * state that specifications for dioxide or chemical ore were formerly 80 to 90 per cent. MnO_2 but much ore has been used running as low as 70 per cent. MnO_2, iron should be under 2 per cent., copper not exceed 0.02 per cent., and cobalt, nickel and arsenic should not be present in appreciable quantities.

Applying these specifications to the highest grade ore at Horseshoe it is evident that though the chief constituent MnO_2 is on the low side it still could be considered as chemical ore of a sort if it were not for the excessive percentage of iron, which is far above the limit set down in any specification. Chemical ore at Horseshoe must therefore be regarded as non-existent unless the Company can obtain a definite quote from some firm who may see fit to use it for a special purpose.

With regard to quotations for Metallurgical ore there appears to be as much variety in the specifications as for Chemical. Spurr and Wormser state that in England and Germany the common basis is 50 per cent. Manganese at so much per unit, with a small bonus or penalty for each unit above or below standard, a maximum of 8.9 per cent. silica and 0.20 or 0.15 per cent. phosphorus. A specification furnished me by the Secretary for the Company for Metallic ore requires—

Manganese—48.50 per cent.
Silica—8.00 per cent. or under.
Iron—7.00 per cent. or under.
Phosphorus—0.16 per cent. or under.

*The Marketing of Metals and Minerals. By Josiah Edward Spurr (Editor Eng. & Min. Journal) and Felix Edgar Wormser (Assist. Editor Eng. and Min. Journal).

In order to ascertain the percentage of phosphorus, four average samples of the higher grade ore were analysed with satisfactory results, all of which were below the above specification. As the iron contents are about correct and the silica much below standard, the two higher grades of Horseshoe ore should be readily marketable at current rates, which at present are ruling at about 1s. 2d. per unit C.I.F. England. I am afraid that the lower grade and ore under 40 per cent. manganese are too rich in iron to be marketable except under some possible special contract. With regard to this statement it may be quoted that the Broken Hill Proprietary are shipping low-grade ferro-manganese ore to America from Iron Knob. This is correct, but the ore is particularly free from impurities and is being put on boats for a very few shillings per ton; so the comparison cannot be regarded as a parallel case.

Cost of Mining and Transport.

Mining.—With few exceptions the deposit has been proved to be irregular and containing variable quantities of waste and low-grade ore which would necessitate sorting and extra transport. The fractured nature of the deposit is also detrimental to cheap mining, as it was found to be impracticable to drill holes of any considerable depth. Light charges would be necessary so as not to break up the ore, otherwise there would be likelihood of considerable loss incurred by the fines mixing with the waste. A considerable amount of spalding would be necessary, which would also increase the cost. The ore as a rule bores quickly, though difficulty in this respect was experienced in some of the holes. Taking all these factors into consideration the average costs of mining the deposit would not be so low as might appear at first, and I should place them at not less than 6s. or 7s. per ton for the ore landed on trucks at the mine and allowing for the removal of the waste.

Transport.—I have no definite opinion as to what the cost of railing from the mine to Meekatharra would amount to per ton, and can only assume a cost proportional to distance and cost per mile quoted by the Government from Meekatharra to Geraldton, which works out roughly at 5s. per ton.

Handling Charges at Geraldton.—The Company's figures for this item were four shillings with a suggestion that if there are sufficient bins the charge can be reduced to 2s. per ton—say 3s.

Freight (Ocean).—Company's figure is 25s.

To these must be added overhead charges, etc., which I am not prepared to estimate.

The costs are probably, therefore, as follows:—

	£	s.	d.
Mining at Horseshoe	0	6	6
Railway freights to Meekatharra ..	0	5	0
Railway freights, Meekatharra to Geraldton	1	0	0
Charges at Geraldton (average) ..	0	3	0
Ocean freight	1	5	0
	2	19	6

The above makes no allowance for charges at Meekatharra, interest, insurance, commission on sales, which will no doubt bring the total to well over £3 per ton.

Conclusions.—The sampling of the southern deposit has proved:—

1. That there is no chemical ore—the iron contents being far too high to comply with any recognised specifications.
2. Of metallurgical ore there is at least 81,000 tons containing 50.7 per cent. manganese with a possible 10-15,000 tons of the same grade at the eastern end of the deposit, which has not been sampled. The iron content of this grade is below specifications.
3. Of the second grade 45-50 per cent. manganese there are 83,000 tons but the iron content is on the high side.
4. Ore of the lower grades contains too much iron to conform to specifications, though no doubt some of this class of ore could be sold at a reduced price as low-grade ore.
5. With the exception of iron contents the ore as a whole is free from penalisable impurities, the amount of silica being particularly low.
6. With the ruling price per unit at 1s. 2d. C.I.F. London and the costs of production and transport as quoted, the best grade would not cover costs, so until the market firms considerably or the company can put up some fresh and positive evidence which may alter the existing conditions, I cannot recommend any capital expenditure for the erection of ore bins, etc., at Geraldton or in any other direction.

Before closing my report I would like to express my sincere thanks for the help and courtesy shown me, both by the representatives and staff of the Manganese Company and to Mr. Elliot of the Broken Hill Proprietary.

REPORT ON THE OCCURRENCE OF BITUMINOUS MATERIAL WHICH MR. HASSELL COLLECTED ON CHEYNE BEACH AND FORWARDED FOR IDENTIFICATION.

T. Blatchford, B.A.

In accordance with your instructions I visited Cheyne Beach in the company of Mr. H. Hassell and collected a second sample of the bituminous material which he had reported.

Locality.—The bitumen occurred in two localities:

(1) On the beach lying west of Warriup Creek.

(2) At a spot some three miles to the east of the first locality and close to the mouth of Cordanup Creek.

The material was only found in small flat pieces from the size of a sixpenny silver piece to mere grains. The pieces were irregularly scattered over quite a considerable length of beach, 400 to 500 yards, and from the water's edge to well up the sides of the sand dunes where it had, no doubt, been deposited by the waves and winds during rough weather.

Mr. Hassell's statements about the occurrence are as follows:—

1. That although he has been a frequenter of the beach for many years, neither he nor any of his employees had noticed the bituminous material under review before the month of November, 1927.

2. That both Mr. R. C. Wilson, A.S.M.E., and Mr. Le Mesurier had a few months previously passed over the beach near the entrance to Warriup Creek and neither had observed the occurrence, though it was in abundance when he first found it a few months afterwards.

3. That in his opinion it is therefore a quite recent occurrence, and in no way connected with the ordinary bituminous jetsam, so commonly reported along the coast.

4. He considers that it was not derived from sources where mineral oil might have been used, such as for windmills, garages, motors, etc.

5. That according to his observations it is only found in the two localities referred to, and that it is in greater abundance during heavy easterly weather.

Geology.—The geological features of the country in the vicinity of Cheyne Beach are comparatively of a simple character. There are two classes and two ages of rocks—Pre-Cambrian granites or gneisses and sedimentary beds of Miocene age. The granites and gneisses commence immediately north of Warriup Creek and Green Range and extend far away to the north. A narrow belt of granite is also exposed along the coast between Lookout Point and Albany.

A considerable development of Miocene Beds lies between the two granite areas and follows up the valley of the Kalgan River as far north-west as Kendenup.

Further afield the Miocene beds have been located at Tambalup, Ongerup, and as far north as Norseman. Extensive areas of Miocene beds are also found in the Fitzgerald River Valley, and they also form a strip of country, some few miles wide, lying immediately to the north of the Barren Ranges. These beds have so far not been accurately surveyed.*

There is no doubt that the Miocene beds were laid down in a comparatively shallow ocean (fossil sponges abound in some of the beds), the floor of which has since risen. The highest point at which the beds have been recorded is in the vicinity of St. Ives, which has an elevation of well over 1,000 feet above sea level.

As the basal beds of the Miocene series are exposed at sea level, there is no doubt that the deposit was originally at least 1,000 feet in thickness, probably much more. Probably the greatest thickness on the land surface will be found in the Fitzgerald Brown Coal series, which is no doubt a sunken field of Miocene strata, similar in occurrence to those at Collie and Wilga. Whether the Miocene beds extend past the coast line to the south and cover the Continental Shelf, which is some 30-35 miles wide, is difficult to decide. Within the above limits it is noteworthy that the soundings are very uniform with a variation only of a few fathoms, which rather points to the absence of extensive denudation and suggests the possibility that the beds were faulted down and failed to rise above sea level.

Further to the south of the 35-mile limit the soundings suddenly rise to 1,500-2,000 fathoms.

Following on the theory that a section of the beds had been faulted and that the bitumen was a seepage, I requested Dr. Simpson to investigate whether there could be any genetic connection between the oil extracts from the Fitzgerald brown coal and the bitumen. He could find none, so this source for the

*The mapping of the south coast ceased on the death of H. P. Woodward in the year 1917.

bitumen is not very hopeful, and the old idea that the flotsams are carried by ocean currents on to the coast will have to stand for the present and for this particular case also.

I still consider, however, that the bitumen was not derived from oil spilt from ships' engines, etc., but has come from a natural seepage.

Attached is a copy of the Government Analyst's report.

Lab. No. 1695.

The Sample, which was said to come from Cheyne Beach, consisted of rounded fragments of black material slightly plastic in consistency. Microscopic examination showed the masses to be porous, and associated with clean quartz sand. The presence of fibrous matter or vegetable cells could not be detected.

The sample when freed from adhering sand floated on water.

Solubility: The sample was completely soluble in carbon bisulphide and turpentine, but only partially soluble in petroleum spirit.

A separation by solvents was as follows:—

	Per cent.
Soluble in petroleum spirit	70.2
Residue soluble in carbon bisulphide ..	22.5
Carbonaceous matter	.3
Mineral matter	6.3
Water	.7
	100.0

The petroleum spirit soluble portion consisted of a dark brown wax with melting point of 72°C.

The carbon bisulphide portion consisted of a black lustreless bitumen with no definite melting point, but softening at 95° approximately.

The mineral matter consisted of sand grains and iron oxide, representing 4.6 per cent. and .80 per cent. respectively of the total, together with traces of calcium, magnesium and sodium.

Ultimate Analysis:

	Per cent
Carbon	77.8
Hydrogen	12.5
Nitrogen	.2
Sulphur	.7
Ash	6.3
Moisture	.7
Oxygen (by difference)	1.8
	100.0

Calculated to the N, S, ash, moisture and O free sample, this represents a hydrocarbon, or more probably a mixture of hydrocarbons, containing C 86.2 per cent.; H 13.8 per cent., approximating to the general formula C_nH_{2n}, which, according to R. Heger, most closely represents the composition of Ozokerite.

The percentage composition of Ozokerite is given as C, 85.7 per cent.; H, 14.3 per cent.

There is no indication that this material has any relationship to the Fitzgerald River brown coal. It appears to be an inspissated petroleum, but whether the removal of the light oils was effected by nature, in which case this material is a crude ozokerite, or by human agency, it is impossible to say.

(Sgd.) EDWARD SIMPSON,
Government Mineralogist and Analyst.

GEOPHYSICAL PROSPECTING AT NORTHAMPTON BY THE ELECTRICAL METHOD.

The Geophysical Research party, under the leadership of Mr. J. C. Ferguson, arrived in Northampton about the middle of the month of June. When they had become established on the Wheal Ellen Mine, I joined the party for a few days to discuss the geological side with Mr. Ferguson and to inspect several other areas in the northern end of the field, which must also prove favourable for investigation. Samples of the waters, etc., were also collected for analysis.

In July arrangements had been made for Dr. Bieler and Professor Rankine to join issue and discuss the problems at Northampton on the ground with Mr. Ferguson.

Unfortunately, Dr. Bieler, on his way to Northampton, became seriously ill and after a very short illness passed away in the Geraldton Hospital. In addition to the loss to his friends and fellow officers, by whom he was held in the highest respect, Dr. Bieler's untimely end was a serious loss to the Geophysical Research in Australia and to the scientific world in general.

Professor Rankine continued his journey and joined the party for a few days during the latter days of the month.

At this time the party had completed the survey of the Wheal Ellen Mine and had commenced that of the Baddera. The survey of this and the Mary Spring, South Geraldine, and Block 7 mines has since been completed and a full report of the results from Mr. Broughton Edge, the Director of the Survey in Australia, is expected shortly.

BREN'S AND LIDSTER'S REPORTED TIN LODES, 9 MILES SOUTH-EAST OF MOUNT DOCKEREL.

T. Blatchford, B.A., Government Geologist.

An inspection of this area was made on account of several samples being sent in and which contained either tin or tantalite or both.

Locality: Most of the samples were labelled as coming from the north-eastern end of Cummins Range. As the position of the Cummins Range is not correct on the Lands map, the locality had best be referred to as Mt. Dockerell, which is a definite and fixed landmark. The workings, as shown me by B. Essau, whom I fortunately met in the locality, are situated on the head of the Willy Willy Creek, but a short distance down from the watershed, which separates

these waters from those of Wolf Creek. There were no prospectors on the ground, Brens having employment on the Margaret Downs Station and Shaw was working a rich leader some ten miles distant.

Geology.—The rocks in the area and for some miles around consist of the group originally named by E. T. Hardman "Metamorphics." These metamorphics may be best described as a very old formation of sedimentary rocks and lavas, which have been subjected to much stress and chemical alterations. They represent some of, if not, the oldest rocks of the State and comprise mica schists, phyliites, etc., crossed and recrossed by more recent intrusive basic dykes and pegmatites.

This belt of metamorphic rocks extends as a fringe around the Kimberley plateau, ending at Yampi Sound, on the western extremity and is the mineral belt of the Kimberleys.

Bren's Find.—I do not think there is any doubt that the prospectors found small quantities of stream tin and tantalite in some of the narrow gullies, joining the upper course of the Willy Willy Creek, but as these courses are invariably narrow, there would be no hope of locating a large deposit of alluvial.

With regard to the reported lodes, there is no doubt that a confusion arose and what was considered tin, was really a much altered tourmaline. This tourmaline occurs plentifully in many of the pegmatites, and it is highly probable that the small amount of stream tin and tantalite have been derived from this source. I broke a sample from one of the pegmatites, which had been exposed by the prospectors, but with negative results as regards both tin and tantalite.

The position may be summed up as a genuine mistake on the prospectors' part, much exaggerated by outside speculation.

BORING FOR MINERAL OIL AT POOLE RANGE.

T. Blatchford, B.A., Government Geologist.

The state of the bore at Poole Range in October, 1928, is set out on page 5, G.S.W.A., A.R. 1928. Oil was struck at a depth of 2,085 feet, but the hole became flooded with water to within 127 feet of the surface. The hole was then filled with clay and temporarily closed pending arrangements being effected to cement off the water.

On my arrival at the bore on 10th September, 1929, the mud had been cleaned out to a depth of 2,078 feet, *i.e.*, seven feet above the level of the oil sands.

A cement bridge 10 feet thick was then put in on top of the mud and a six-inch casing lowered to the top of this cement and cement pumped in around the casing from the surface until the pressure rose to 300 lbs. to the square inch.

The cement was allowed to remain setting for a period of one month. After my arrival the water was gradually lowered in the casing by baling until it was proved to the satisfaction of all present that the casing was water-tight.

A hole was then carefully bored through the cement bridge until the clay was reached and still there was no water. On continuing the boring in the mud, water very suddenly broke in and rose to a height of 242 feet below the surface, or 115 feet below the original level. The water would obviously have come from three sources:—

(a) Top waters due to the cement behind the casing failing.
(b) From the oil sands.
(c) From below the oil sands.

Top Waters.—It appeared highly improbable that the water was top water for it was not likely that the cement behind the casing would fail. The fact that the water did not reach the original level also points strongly to this conclusion.

Oil Sand Water.—There is little doubt from the evidence that the oil sands were flooded and that the water was held in balance by the open top waters, *i.e.*, before cementing, when the pressure was removed the water in the oil sands would, under normal conditions, flow back into the hole, and particularly if there was any gas pressure behind them.

Bottom Water.—Had the flow been from strata below the oil sands it would be natural to suppose that the mud would have been driven up the hole.

The evidence, to my mind, is in favour of the water coming back from the flooded oil sands.

Bailing under normal conditions made no impression on the water in the bore, and as Mr. Fox objected to "swabbing" it was agreed to continue bailing until the gear for a pump could be assembled. Pending these arrangements I left the bore on 15th September, intending to return later after the pump had been installed.

After my departure swabbing was tried and as no impression was made on the level of the water, it was decided to cement the hole up from the bottom, abandon the oil sands at the 2,085 feet level, and carry on with a five-inch hole and look for a lower horizon.

From a State point of view what must now be watched is whether the cement holds or not, for in my opinion, boring in a wet hole, except under special conditions, should not be allowed. From personal conversation with Dr Woolnough I know he was of the same opinion, and I refer you to his written statement reading thus:—

> The risk of flooding of the entire field is too great and oil legislation in every part of the world is most drastic in this connection.

BORING FOR COAL IN THE VICINITY OF NANNUP.

(T. Blatchford, B.A., Government Geologist.)

Introduction.—For many years past various attempts have been made by different parties to locate by boring payable coal seams in the extreme south-western corner of our State. Details of this boring may be found either in an extract of the Mining Handbook, by A. Gibb Maitland, Bulletin 65 (G.S.W.A.), by H. P. Woodward, or in an article by R. C. Wilson on oil prospecting in the area under consideration, which appears in the Annual Report of the Mines Department for the year 1921. For the present purpose it will not be necessary to recapitulate all the details set out in these reports, though a summary of the more important results will be necessary.

The present inspection has arisen from the fact that a fresh party have reported finding coal in a bore near Bibilup Siding on the Wonnerup-Nannup Railway Line.

Geology.—The main structural features of the area in question are twofold, and comprise a depressed valley or sunkland bounded by the Darling scarp fault on the east and probably a second fault lying immediately to the east of an exposed granite ridge extending from Cape Naturaliste on the north to Cape Leeuwin on the south (*).

The strata lying in the sunkland consist of shallow surface sandy deposits or laterites which overlie beds of sandstones, grits, shales, coal and lignite seams, and possibly conglomerates. Basalt has also been found in several places and probably represents a sill or buried lava flow. Geologically the age of these deposits is considered by most observers to be Carboniferous or Permo Carboniferous, corresponding to that of the Irwin River, Collie and Wilga Coal Fields. If the main structural feature of the coastal plain be considered, it seems highly probable that the beds are a continuation of the Irwin River series, the Collie and Wilga areas being minor and detached sunklands of the same formation.

*By expressing the idea of a second fault I find I am not in accord with previous writers, who no doubt based their opinion on the assumption that Nos. 5 and 6 Busselton bores bottomed on gneiss or granite. That this is so is not at all conclusive, for in No. 5 bore, gneiss was passed through and red granite struck, which points more to the nature of a conglomerate, also in No. 1 bore, Venn's Estate, gneiss was passed through into sandstone, the gneiss being undoubtedly a boulder. Furthermore, if the boundary line between the western granite and the sediments be continued to the north, it is in fair alignment with the edge of the continental shelf (*vide* Admiralty Chart).

Coal Deposits previously located in the District.

Fly Brook and Warren River (South-Eastern corner):

A number of bores were put down at Fly Brook, the deepest of which was 128 feet. This particular bore passed through 17 seams of coal aggregating 20 feet in thickness. The largest seam was 5 feet 4 inches in thickness, but had a 6 inch clay parting: the next largest seam was 2 feet 4 inches with a 3 inch parting. Compared with Collie and New South Wales coals, the following analysis shows the Fly Brook coal to be very like Collieburn Collie coal:—

——	Fly Brook.	Collie-burn.	Collie Prop.	N.S.W.
Water	14·51	13·81	12·39	2·22
Volatile Matter ...	37·89	36·16	26·79	29·94
Fixed Carbon ...	44·89	45·19	52·01	58·99
Ash	2·71	4·84	8·81	8· 85

At the Warren River, No. 3 Bore attained a depth of 1,700 feet, the first 500 feet of strata corresponding with the Fly Brook measures, though the coal seams were insignificant.

From 500 to 1,700 feet most of the rock passed through was detrital granitic material, the bore evidently being too close to the scarp fault to disclose the true nature of the lower strata.

Busselton District:

Six bores were sunk in the vicinity of the Vasse River, a few miles south of Busselton, to depths varying from 144 to 653 feet. Although 25 coal seams were passed through, no seams of a payable nature were discovered, the greatest thickness of any seam was 3ft. 6in. No records of any analyses are procurable.

Donnybrook:

Several seams of low grade coal were struck in the old shafts worked originally for gold, but none of the coals were of a quality fit for commercial use. The following are the results of some analyses taken by the staff of the Geological Survey from P.A. 155H.

——	1.	2.	3.	4.
Moisture	26·95	31·34	31·28	35·00
Volatile Hydrocarbons	25·46	28·43	31·57	28·60
Fixed Carbon ...	21·98	24·37	26·12	24·70
Ash	25·61	15·86	11·03	11·70
Calorific value ...	5710	6315	6928	6429

And a sample of a seam 5 feet in thickness taken from a depth of 73 feet in Murphy's Shaft:—

No. 1. Moisture 36.28 parts per 100.
Volatile Hydrocarbons 21.67
Fixed Carbon 22.60.
Ash 13.50.
Calorific vaue 6072.

Jarrahwood.—Coal was discovered here on P.A. 8627 near the crossing of the Wonnerup-Nannup railway line. Several seams of a coaly nature were reported but proved to be of too low a grade to be of any importance.

Coal has also been reported from the Preston River, a few miles from Bunbury, and at Alexandra Bridge, and six miles north of Longbottom Farm, on the Blackwood River. From the second locality I was able to collect a sample of coal which was lying scattered over the sandy bottom of the river, the result of which is attached.

Recent Developments in the vicinity of Bibilup.—In the vicinity of Bibilup a series of five hand bores have been sunk well within the sedimentary area and in one bore a seam of coal of a thickness of 7 feet 6 inches has been reported. Furthermore a sample of this seam which occurs in No. 4 Bore at a depth of 165 feet to 172 feet 6 inches has been very favourably commented on by the Government Mineralogist and Analyst, who states that the sample is "a valuable coal if there is any quantity of it available." The following is the result of the analysis:—

	Per cent.
Moisture	12.87
Volatile hydrocarbons	37.75
Fixed carbon	43.84
Ash	5.54
	100.00

Unfortunately, as is almost the invariable experience with handboring, a very small sample of the coal was recovered, and the syndicate financing the original boring now desires to test the discovery with a calyx drill on £ for £ basis.

A fair summary of the possibilities and probabilities of finding coal at Bibilup appear to be as follows:—

1. The area in which the boring is suggested is undoubtedly a coal bearing zone, probably of the same age as the Irwin River and Collie Fields.
2. Coal of varying qualities has been found throughout this area, but up to date no payable seam has been discovered, though the quality at Fly Brook was equal to that of the Collieburn seam.
3. The sample of coal produced by the syndicate as coming from their bore No. 4 at a depth of 165 feet equals that of a good Collie coal.

4. The syndicate are desirous of prospecting to depths beyond those which they can reach with a hand-boring plant, and are prepared to pay £ for £ of total cost of boring to a depth of 750 feet.

5. It is evident that the syndicate are prepared to support the work already done by putting up substantial money to do further testing both of the seams which their borer has found and also to endeavour to locate deeper seams.

Provided the work of boring is carried out with a Calyx drill and a reliable foreman, and the syndicate pay half the cost, my opinion is that as there is quite a reasonable chance of finding payable seams, boring under these conditions is justifiable and I recommend accordingly.

THE PRE-CAMBRIAN AREAS OF WESTERN AUSTRALIA.

Introductory.—At the Geological Conference held in Adelaide during the month of May, 1928, it was decided that individual members representing the various States be requested to supply a map showing the areas occupied by the Pre-Cambrian rocks in his State.

By mutual consent Professor E. deC. Clarke and the writer undertook to supply a paper and map as applied to the Western Australian section.

As Professor Clarke had previously written a short paper on the same subject he kindly consented to write the fuller report, hereunder, with slight alterations and additions, resulting from mutual collaboration.

We are both indebted to Miss F. Armstrong for the active part she took in the compilation of the map.

T. BLATCHFORD, B.A.,
Government Geologist.

PRE-CAMBRIAN IN WESTERN AUSTRALIA.

The supposedly Pre-Cambrian rocks of Western Australia cover about one-third of the State, and because they yield most of our mineral wealth, have been more closely studied than any other group of rocks. But the areas studied are separated by wide spaces, the geology of which is known only in a general way, and since palæontological help is as yet lacking, correlation of the various types of rocks found in one district with those found in another is very difficult.

Some attempt at such correlation, resulting in the division of the Pre-Cambrian into 5 Series. was made in 1923.* The following statement is partly an abbreviation of this very condensed paper but contains several notable modifications.

The Yilgarn Series.—At various places in the Yilgarn Goldfield (of which Southern Cross is the best known centre), *e.g.*, Westonia, Parker Range, Marvel Loch, are chiastolite and andalusite rocks, quartzites and crushed quartz conglomerates, which Blatchford and Honman consider to be the oldest rocks of the Yilgarn Goldfield,† being invaded by "greenstones." The "greenstones" are in turn invaded by granite. In many other parts of the *State lying south of the latitude of Shark's Bay,* occur metamorphic rocks, which in some cases are certainly, in other doubtfully of sedimentary parentage and with which other metamorphic rocks make igneous contact. Examples of such occurrences are:—

(a) The Phillips River District,‡ where are found greatly folded and contorted rocks‖ mainly mica schists and the such-like, "pelites," which Blatchford, Montgomery and MacLaren regard as older than the greenstones and which are metalliferous. Apparently, overlying these "pelitic" rocks is a large succession of quartzites, quartz schists, and similar rocks. As the relation of these two facies has not yet been made out, we have distinguished the sandy phase under the name of the Mt. Barren-Stirling Range Series. This series extends east and west through the Barrens, in one of which (West Mt. Barren), very pronounced folding is shown.

(b) Along the front of the Darling Scarp at Aramadale, Cardup and other places§, is a narrow band of slate and quartzite, invaded by both the greenstone and the granite of the Darling "Range."

(c) About 25 miles north and north-east of Perth, surrounded by the granite and greenstone country of the Darling Peneplain, and also near the supposed continuation of the Darling Fault, are occurrences of staurolite cyanite and quartz schists and quartzites,‖ covering in all, so far as we know at present, an area of about 200 square miles. Farther north, between Moora and Mingenew, a little-known belt of metamorphics may belong to the same series and is shown thus on the map.

(d) It is quite likely that *north of the latitude of Shark's Bay,* there are many areas whose rocks judging from descriptions written many years ago, may well belong to the Yilgarn Series. However, considering the lack of recent detailed information, we think it best to leave these, as on the latest Geological map of the State, in the Mosquito Creek Series—a series regarding which there is some doubt as will appear below. As an instance may be cited, the country between the Wooramel and Arthur Rivers, and at Bangemall and Station Peak¶, where is a series, said to be sediments metamorphosed to quartz and mica schists, marble, etc., and is invaded by both granite and greenstone.

(e) Phyllites and mica schists invaded by granites and by basic rocks, were noted during a

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* Clarke, E. deC.—The Pre-Cambrian System in Western Australia. Jour, Roy. Soc. W.A. IX. Pt. II.

† Blatchford, T., and Honman, C. S.—Geology of the Yilgarn Goldfield. Geol. Surv. of W.A. Bull. No. 71, p. 33, Figs. 1–4 show the characteristics of some of the rocks of this series. Further illustrations will be found in Bull. 63 (Blatchford), pp. 31–43.

‡ Woodward, H. P.—The Phillips River Goldfield. Geol. Surv., W.A., Bull. 35, pp. 11–12. (Woodward regards these rocks as highly metamorphosed igneous).
Montgomery, A., and MacLaren, M.—Philips River Mines. Report on the development of the Phillips River Auriferous Copper Mines, with Geological Report on Mines of the Phillips River Gold & Copper Co., Ltd., Dept. of Mines, W.A. 1914.

§ Honman, C. S.—Geol. Surv. of W.A., Bull. 48, p. 63.

‖ The only published notes on these rocks are by Simpson, E. S., Jour. Roy. Soc. W.A. XII. p. 57, and by Clarke, E. deC., Report Hobart Meeting A.A.A.Sc., 1928, p. 52.

¶ Maitland, A. G.—Geol. Surv. W.A., Bull. 33, p. 41, etc.
Woodward, H. P.—Geol. Surv. W.A., Bulletins 41, describes (p. 12) a series of metamorphosed sediments which he says (p. 10) are possibly and even probably the oldest rocks in the district.

GEOLOGICAL MAP OF
WESTERN AUSTRALIA.

SHEWING PRE CAMBRIAN AREAS ONLY.

TO ACCOMPANY PAPER ON THE PRE CAMBRIANS OF WESTERN AUSTRALIA.

T. BLATCHFORD, B.A.

GOVERNMENT GEOLOGIST.

— Scale of Miles —

Broome
Port Hedland
Onslow
Carnarvon
Ajana
Northampton
Geraldton
Dongara
Derby
Fitzroy River
Wyndham
Hall's Creek
Marble Bar
Pilbara
Nullagine
Minilya R.
Lyndon R.
Gascoyne River
Peak Hill
Meekatharra
Mt Magnet
Laverton
Leonora
Menzies
Kalgoorlie
Coolgardie
Yalgoo
Mullewa
Yuna
Piawaning
Bencubbin
Southern Cross
Trans-Australian Railway
Northam
Merredin
York
Bruce Rock
Narembeen
Norseman
Perth
Fremantle
Eucla
Bunbury
Collie
Lake Grace
Newdegate
Ravensthorpe
Esperance
Hopetoun
Nyabing
Ongerup
Albany
Big Brook
Nornalup
NORTHERN TERRITORY
SOUTH AUSTRALIA

— LEGEND —

Yilgarn Series | Kalgoorlie Series | Mosquito Ck Series probably partly Yilgarn partly Kalgoorlie | Mt Barren-Stirling Ra. Series | Granite | Nullagine

Compiled by F. Armstrong, B. Sc.

recent reconnaisance in the East Kimberley, between the Denham and Ord Rivers, about Lat. 16° 20′ long. 236° 30′. It was not possible to search for evidence as to the relationship between these rocks and the "greenstones" lying east of them, but there is little doubt that such evidence is available and that the belt has a considerable extension in a north-south direction.

(f) Sillimanite schists, quartzites, etc., occur near Mt. Aloysius (lat. 26°, long. 128° 40′).*

It seems possible that the metamorphic conglomerates of Kanowna† belong to this oldest series of rocks. Many other widely scattered occurrences of highly metamorphic rocks, most of which are pretty certainly sediments and older than both the granite and the greenstone of their neighbourhood, are known,‡ and those which are sufficiently extensive are shown on the accompanying map, as the Yilgarn Series—from the Goldfield in which they are, so far as we know, best developed and in which they have been most closely studied. It is likely that many more patches will be found especially in the areas now shown on the State Geological Map as granite.

It will appear later in these notes that it is uncertain whether all the granites in the State are virtually of one age, and also whether all the greenstones are more or less contemporaneous. Hence, obviously, we cannot assert that all occurrences of metamorphic sediments which are invaded by both the granites and greenstones of their neighbourhood are of the same age. Nevertheless, the use of one series name for all rocks of the same type and relationship, seems an advantage.

Kalgoorlie.—This term used by Honman,§ is convenient because the series is most fully developd at Kalgoorlie. It consists of metamorphosed basic, intermediate and acid lavas dyke rocks and pyroclastics together with some sediments. The most widely developed are the "greenstones" which are metamorphosed dolerites, basalts and gabbros with common, though relatively small, ultrabasic phases. These are the rocks generally termed "diorite" by miners and prospectors.

At Kalgoorlie Feldtmann found that‖ the greenstones are divisible into older and younger. The older consists mainly of metamorphosed basic lavas. Apparently invading them is a later series of metamorphosed basic and ultra basic rocks—the "younger greenstones." Apparently no very constant difference, microscopical or chemical, between the "older" and the "younger" greenstones has yet been discovered, but it seems as if the younger are rather characterised by relics of ophitic texture and by presence of original quartz.

In this connection it may be pointed out that one of the most difficult features of the greenstones is that marked megascopic differences are often little indication of real difference. Nearly all the epidiorites of the Kalgoorlie Series have been affected by dynamic metamorphism, but the amount varies, so that greenstone-schists or even graphitic slates will be found in actual contact with a massive greenstone —which it is, of course, only natural to suppose is a later intrusion. Further observation in the field and microscope-study show, either that the apparent intrusion is only a portion of the greenstone which has escaped the excessive shearing or, more likely, that owing to some small difference in composition or surroundings the obviously sheared rock owes its appearance to more advanced weathering.

The "younger greenstones" are the chief gold-bearing rocks of Kagoorlie and rocks precisely similar microscopically and in field occurrences carry the ore bodies in nearly every one of the gold mining centres of the State, at any rate in those south of the latitude of Peak Hill (in the Pilbara District). Maitland calls similar rocks the "Warrawoona Series," but nowhere except at Kalgoorlie has satisfactory evidence been adduced for the existence of two "ages" of greenstones so that we cannot say whether the greenstones elsewhere are equivalent to the older or to the younger greenstones at Kalgoorlie.

Besides the greenstone facies of the Kalgoorlie Series there is developed in the country between Leonora and Kalgoorlie and also south of Kalgoorlie a very considerabe area of metamorphosed rocks whose original character is in most places very difficult to determine. Some of them appear to have been originally sediments, others acid flows and pyroclastics. Evidence of the relationship of these rocks to the greenstones is rather scanty. It may be, and one of us (T.B.) inclines rather definitely to this view that they are best classed with the older Yilgarn Series and are the remnants of the folds of ancient sediments which were invaded by the older series of greenstones. On the accompanying map these sediments near Kalgoorlie are therefore shown as Yilgarn. On the other hand there appears to be in places a little evidence that these sediments are contemporaneous with the greenstones—using contemporaneous in a broad way.¶

* Geol. Surv. of W.A., Bulletin 75, p. 89.
† Blatchford, T., and Jutson, J. T.—Geol. Surv. W.A., Bull. 47, p. 19, etc.
‡ These are enumerated in Jour. Roy. Soc. W.A., Vol. IX., Part II.
§ Geol. Surv. of W.A., Bull. 66, p. 44.
‖ Geol. Surv. of W.A., Bull. 69, p. 13.

¶ The following table summarises the latest information on these areas :—

Region.	Bulletin Number.	Acid Rocks, etc.	Sediments.
North of Kalgoorlie	73 78 79 84	p. 25 p. 17 ... p. 31	pp. 32 and 67 p. 49 ... p. 32
South of Kalgoorlie	66 82 90	p. 18 p. 19 p. 17	p. 21 p. 20 p. 17

It is possible, for example, that the "Kurrawang Series" of metamorphosed conglomerates and other finer grained sediments, including chiastolite schists, comes here in the Pre-Cambrian succession. In his first report (Bull. 56, p. 16, etc.) Honman classifies the Kurrawang Series thus, but in a later work (Bull. 66, p. 35) he makes it the youngest formation in the area mainly because "it contains detrital material belonging to the neighbouring porphyries and greenstone schists," but also because at Mt. Jackson, about 100 miles to the WNW "there is a series of conglomerates similar to the Kurrawang Series but resting unconformably on rocks allied to the Kalgoorlie Series." We may note that several visits of inspection to exposures of the Kurrawang conglomerates have not resulted so far as we are concerned in the finding of pebbles of any rocks characteristic of the Kalgoorlie Series.

An apparently very similar series of conglomerates, etc., at Yilgangi has been described by Jutson in Bulletin 73, p. 66.

Again a series of gold-bearing conglomerates at Yandanhoo Hill, in the Yalgoo Goldfield* (about lat. 29° 30′, long. 117° 20′) may come here in the succession.

It is suggested that in the Kalgoorlie Series we have the altered products of a long period of igneous activity in which there were in places relatively insignificant periods of quiescence and sedimentation. This period might, on Chamberlain's conception of the early stages of the Earth's history, be imagined to be ushered in when the first formed acid shell cracked and to some extent foundered in the more basic substratum with consequent squeezing out of some of the basic magma. The basic magma contained much smaller only partly assimilated patches of more acid material formed by melting of portions of the acid shell. These more acid portions have been recognised in the country between Menzies and Duketon. This period of igneous activity was protracted and the lavas, tuffs, etc., of its earlier part would be cut, later in the same period, by dykes originating from the same magma. It seems therefore, that while in some parts of the State greenstones of two or even more ages—since one will invade others, will be found in other parts no such evidence will appear, and, therefore, it is clear that accounts of the Kalgoorlie Series from different parts of the country will not tally.

Mosquito Creek Series.—Among Western Australian geologists it is generally believed that in the North-West Land Division of this State there is developed a series younger than the Kalgoorlie Series, *i.e.* younger than the auriferous greenstone series in whatever part of the State it may occur. This younger series is stated to consist in the main of sediments which are metamorphosed, though not as profoundly as those of the Yilgarn series, and which like the rocks of the Kalgoorlie Series may carry gold-bearing lodes. Maitland in his Summary of the Geology of Western Australia,† p. 17, writes that the North and South Dromedaries Range east of Nullagine township is made of vertical beds of conglomerate containing numerous pebbles of the laminated quartz and jaspilite which form part of the Warrawoona Beds, which, as already mentioned, are the equivalent in this region to the Kalgoorlie Series. Dr. E. S. Simpson, who has examined the rocks of this region, is also of opinion (personal communication) that there occurs in this part of the State a series of metamorphic sediments containing fragments of the Kalgoorlie Series.

However, one of us (T.B.) who has travelled widely in this "North-West" region inclines to the opinion that some of the metamorphic rocks which have been mapped as Mosquito Creek are really part of the much older Yilgarn Series, others may be representatives of the sedimentary facies of the Kalgoorlie Series and others belong to the much later Nullagine Series. It is felt that until more precise information is available regarding the individuality or otherwise of the occurrences marked Mosquito Creek Series on the latest geological map of the State it will be wisest to draw attention to the lack of coordinated knowledge of the geology of this portion of the "North-West" by indicating the areas concerned as "Mosquito Creek Series, possibly partly Yilgarn, partly Kalgoorlie."

If the presence of fragments of rocks of the Kalgoorlie Series in such conglomerates as the Karrawang, Yilgangi and Yandanhoo (see above) is established, then these formations would be included in the Mosquito Creek Series—provided of course that the independence of the Mosquito Creek Series is proved.

We would reiterate that if the Mosquito Creek Series is to be recognised as a distinct member of the Pre-Cambrian it must be proved to be (a) younger than the Kalgoorlie Series and yet (b) distinctly metamorphosed.

Main Granite Series.—A large part of the State is, on the latest geological map, shown as "Granite and Gneiss." It has been noted above that acid and acid-intermediate rocks form part of the Kalgoorlie Series. There is usually little difficulty in distinguishing them from the Main Granites which are clearly intrusive into the Kalgoorlie Series. But the coarser grained fragmentals of the Yilgarn Series where most metamorphosed are almost indistinguishable from igneous gneisses, and detailed work on the "granite and gneiss" areas will probably disclose more patches of such metamorphosed sediments. (A good example is Mt. Leonora, described in Bulletin 13 of the Geological Survey of W.A. as a crushed granite but later shown to be most probably a metamorphosed sediment).‡

It must be clearly understood that in the big areas coloured as granite there are small unmapped patches of greenstone. Some are invaded by the granite, *i.e.*, belonging to the Kalgoorlie Series, and thus particularly in the "Wheat Belt" are dykes invading the granite. It is improbable that any of these greenstone areas are large enough to show on the scale of the map submitted.

Apart from these subtractions from the granite and gneiss area which, though interesting, will not be important areally, it is doubtful *whether or not* all the granitic rocks of the State are, even broadly speaking, of the same age. Some geologists have been inclined to regard all the Western Australian granites with gneissic texture or any approach to it as definitely older than those which are massive, but in every area in the Goldfields where the granites have been studied in any detail it has been pretty definitely shown that the gneissic rock grades into the massive. It is suggested that in these instances gneissosity, in whatever degree developed, has been

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* Maitland, A. G.—"The Gold Deposits of Western Australia." Extract from the Mining Handbook, p. 36.
† Extract from The Mining Handbook, Geol. Sur., Memoir No. 1, Chapter 1.
‡ Geol. Surv. W.A., Bull. No. 84, p. 24, and literature there cited.

caused in some places, by drag along contact with the invaded rock (generally "greenstone"), in others is a fluxion structure produced by movement in the magma when partially frozen, and in others is due to shearing after the consolidation of the magma.

While, however, the presence or absence of gneissosity is in itself a poor criterion of the relative ages of different granites in the State it is likely that further work will prove the gneissic granites of Northampton, C. Naturaliste, Albany, and many other localities round the borders of the Western Australian "Shield" to be very much older than those of the Goldfields. The goldfields granites invade the Yilgarn, Kalgoorlie and Mosquito Creek Series (if the last is a separate entity), whereas the marginal gneisses are themselves cut by dykes of a greenstone which seems indistinguishable in every way from the goldfields greenstones. It is suggested that these marginal gneisses may be highly metamorphosed sediments of Yilgarn age mixed with remnants of the "first earth-shell."

Nullagine Series.—This Series was first so named by Maitland,* who wrote—

Next in antiquity to the greenstone schists comes the series of sandstones, grits, conglomerates, thin limestones, and associated volcanic rocks, so well exposed in many portions of the district. For convenience of description, these will be referred to as the Nullagine Beds. This formation, the actual base of which is rarely seen, forms an important feature in the geology of Pilbara and none plays so prominent a part in the landscape. The Nullagine Beds cannot be exactly correlated with those yet described in any of the previous official reports on the geology of Western Australia. In their lithological characters and general behaviour they resemble very strongly the quartzites, etc., which form that continuous formation extending from Wyndham to Mount Hart, a prominent summit on the King Leopold Range, in Kimberley, to which reference has been made in a former report.

If a comparison between two regions, separated by almost five degrees of latitude, be of any value in correlating strata, then there seems to be very strong reasons for identifying the two series of beds. On the strength, therefore, of the lithological and structural similarity to those of the Leopold Range, the Nullagine Beds are assumed to be of the same age, viz., Cambrian; but in view of the deficiency of our knowledge of these beds it is obvious that this assumption is more or less guesswork.

The reference to a former report is to the Annual Report of the Geological Survey for 1901, page 8, where Maitland states—

The staple formation in the country traversed is made up of a series of quartzites, sandstones, fine conglomerates, and shales, disposed in a series of broad anticlinal folds. These beds extend as one continuous formation from Wyndham to Mount Hart, a prominent summit on the King Leopold Range. No fossils were met with in any of the sedimentary rocks, so their position in the geological scale can only be approximately determined. The quartzites of the King Leopold and Mueller Ranges were shown on the map accompanying Mr. Hardman's reports as being of Lower Silurian or Cambrian Age; no geological work having been carried out since the date of that gentleman's examination, no apparent reason can be found to alter them from the position to which he assigned them.

We draw attention to these statements made many years ago because, though knowledge regarding the Nullagine Series in the "North-West," *i.e.*, roughly between latitudes 20° and 26° has greatly increased, particularly by Talbot's work,† still we know very little more about the relation to the Cambrian beds of the series in the Kimberley, which is lithologically similar to the "North-West" Nullagines: in other words we are not certain whether the Kimberley Nullagines are Lower Cambrian or are Pre-Cambrian. In discussing the Cambrian in Western Australia a short note was given on the relationship between the fossiliferous Cambrian rocks of the Kimberley and the rocks underlying them which so closely resemble the Nullagines of the "North-West."

It may further be noted that outliers of horizontal or gently inclined unaltered sedimentary rocks with associated volcanics, which are correlated with the Nullagines, of course merely from lithological resemblance, have been found as far south as Billeranga Hills and Mt. Singleton (about lat. 29° 20). In a recent address to the Royal Society of Western Australia Mr. A. Montgomery drew attention—for the first time we believe—to the fact that the Nullagine outliers together with the occurrence, in areas mainly covered by Nullagines, of inliers of the Mosquito Creek and Kalgoorlie Series might reasonably lead to the conclusions that (a) the Nullagines were laid down on an almost level surface (produced, Mr. Montgomery believes, by marine erosion), which extended from the Kimberley to latitude 29°.

(b) The Nullagines and whatever other formations were deposited over them have been entirely or almost entirely removed during the long period of Western Australia's existence as a land area (which may date from the Cretaceous or even earlier).

(c) The old pre-Nullagine surface has been but slightly eaten into during the later erosion period which, as stated above, may have begun in Cretaceous.

BORING FOR COAL IN ERADU DISTRICT BY STATE AID.

T. Blatchford, B.A., Government Geologist.

Summary of Previous Boring.

Carboniferous strata in the Greenough District were first recognised by the late T. Gregory in 1860, though the probability of coal being found was first suggested by the late H. P. Woodward in 1888.

Woodward based his opinion on the similarity of the strata to those of the Irwin River series.

The first deep bore was started at the 47½ mile peg on the railway line in 1904, the bore reaching a depth of 1,417 feet without locating coal.

Two years later a calyx bore was put down in the bed of the Greenough River some mile distant north of Eradu Railway Station. There a six-foot seam of coal was passed through at a depth of 116-122 feet.

An analysis of this coal is as follows:—

Moisture, 9.59.
Volatile Hydrocarbons, 40.28.
Fixed Carbon, 37.97.
Ash, 12.16.
Calorific Value B.T.U. 9,900.

Following this last bore some shallow hand bores were sunk in the same locality to ascertain the dip which, on the evidence obtained, proved to be E.S.E.

Hindley's bore was then started about one mile distant from the calyx bore on this dip, but though the hole reached a depth of 736 feet, no coal was

* Geol. Surv. W.A., Bull. No. 15, p. 10.

† Geol. Surv. W.A., Bulls. 83, 85, and 87.

found. Shortly afterwards a further attempt was made to locate the coal seams by drilling a hole to a depth of 1,006 feet, two miles south of Eradu on the west side of the Greenough River. This bore, known as Musk's Bore, though it passed through unquestionable coal measures also failed to locate any coal seams.

About this time a series of shallow bores was sunk along Kockatea Creek, most of which bottomed on granite, though one of the most westerly, No. 27, passed through a black carbonaceous shale 10 feet thick, at a depth of 120 feet.*

No further boring was done until the year 1926, when it was decided to further test the field in order to locate the extension of the seam found in the calyx bore sunk in the Greenough River bed, and if possible ascertain more accurately the dip, bearing in mind always the possibility of locating other seams.

A calyx plant was installed and nine holes put down, the logs of which, as supplied by the foreman, together with the analyses of the coal struck in the various bores, are as follows:—

LOG OF BORE CORES RAISED FROM No. 1 CALYX BORE AT ERADU

(1 mile West from Eradu Siding on Railway Reserve).

Boring ceased 17th Nov., 1926.

No. of Sample.	Depth of Core.						Description of Core.
	ft.	in.		ft	in.		
1	30	0	to	64	0		White gritty sandstone.
2	64	0	„	75	0		Finer grained yellow sandstone.
3	75	0	„	98	0		Similar to No. 1 Sample.
4	130	0	„	140	0		Fine-grained argillaceous sandstone.
5	140	0	„	157	0		Coarse-grained red sandstone.
6	159	0	„	170	0		Micaceous shale.
7	164	0	„	166	0		A band of darker shale.
	170	0	„	180	3		Coal (?)
	181	6	„	183	0		Coal (?).
8	183	0	„	188	4		Grey shale.
	188	4	„	190	3		Coal (?).
9	190	3	„	199	0		Grey shale.
10	199	0	„	204	0		Coarse sandstone.
	207	0	„	240	0		Conglomerate.
11	240	0	„	244	0		Shale. Contains organic matter—possibly plant remains.
12	244	0	„	344	0		Soft sandstone. Practically no core.
13	344	0	„	345	0		Shale.
14	408	0	„	464	0		Friable sandstone.
	464	0	„	470	0		Soft friable shale.
15	470	0	„	544	0		Friable sandstone with minor bands of shale similar to 464-470 feet.
16	544	0	„	550	0		Shale.
	550	0	„	580	0		Similar to 16.
	580	0	„	587	0		do.
	587	0	„	637	0		No core. Sandstone.
17	637	0	„	640	0		Dark shale.
18	640	0	„	663	9		Sandstone with shale bands. (Sample of shale.)
	663	9	„	668	0		Dark shale similar to shale bands in 18.
	668	0	„	686	0		Soft friable sandstone with minor bands of shale.
	686	0	„	695	0		Shale similar to 18.
	695	0	„	803	9		Sandstones with minor bands of shale.
	803	9	„	804	1		Band of pyrites
19	804	1	„	832	0		Fine grey shale to bottom of hole.

All the coal core was forwarded direct to the Government Mineralogist and Analyst for analysis.

Log by T. Blatchford.

PROXIMATE ANALYSES—No. 1 CALYX BORE, ERADU.

No.	3096/26	3097/26	3098/26
Depth	170′ to 180′ 3″	181′ 6″ to 183′	188′ 4″ to 190′ 3″
Proximate Analysis—		%	%	%
Moisture		13·66	10·67	7·78
Volatile matter ...		36·41	31·32	26·65
Fixed carbon ...		24·74	30·69	29·00
Ash		25·19	27·32	36·57
		100·00	100·00	100·00
Calorific Value of B.T.U.		...	5,493	...
Colour of ash		Light brown.	Dirty white.	Brownish white.

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

No. 2 COAL BORE, ERADU.

Commenced 20-1-1927. Completed 23-3-1927.

Depth of Core. ft.	in.		ft.	in.	Description.
0	0	to	14	0	Yellow sand.
14	0	„	27	10	Yellow sandy clay.
27	10	„	76	0	White sandstone
76	0	„	90	0	Reddish sandstone.
90	0	„	109	0	Soft sandstone with bands of clay.
109	0	„	109	6	Conglomerate.
109	6	„	110	9	Tough grey shale.
110	9	„	112	0	Dark shale.
112	0	„	127	0	Grey shale
127	0	„	135	0	Smutty carbonaceous matter.
135	0	„	138	6	Gray shale
138	6	„	139	6	Smutty carbonaceous matter.
139	6	„	144	8	Gray shale.
144	8	„	151	6	Coarse grit with shale bands.
151	6	„	153	0	Dark shale.
153	0	„	156	0	Carbonaceous shale or brown coal.
156	0	„	163	0	Gray shale.
163	0	„	191	0	Gritty sandstone with conglomerate boulders and pyrites.
191	0	„	194	0	Grey shale.
194	0	„	208	0	Coarse sandstone with bands of shale.
208	0	„	261	0	Soft coarse sandstone with bands of shale and boulders.
261	0	„	314	0	Soft coarse sandstone with shale bands.
314	0	„	350	0	Soft dark sandstone.

PROXIMATE ANALYSIS—No. 2 BORE, ERADU.

No.	992/27	993/27	994/27
Depth ...	127′ to 135′	138′ 6″ to 139′ 6″	153′ to 156′
Proximate Analysis—		%	%	%
Moisture		12·20	8·00	9·40
Volatile matter ...		26·89	24·76	21·48
Fixed carbon ...		21·22	22·89	28·52
Ash		39·69	44·35	40·60
		100·00	100·00	100·00
Calorific Value—B.T.U. ...		Not determined	Not determined	·5699

The ash in these coals is far too great for any of them to be of value as a fuel.

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

(Analyst: H. Bowley.)

* For full particulars of this boring, the reader is referred to Miscellaneous reports in Bulletin 59, G.S. W.A., by H. P. Woodward, and Bulletin 38, G.S. W.A., by W. D. Campbell.

— PLAN SHEWING BORE SITES —

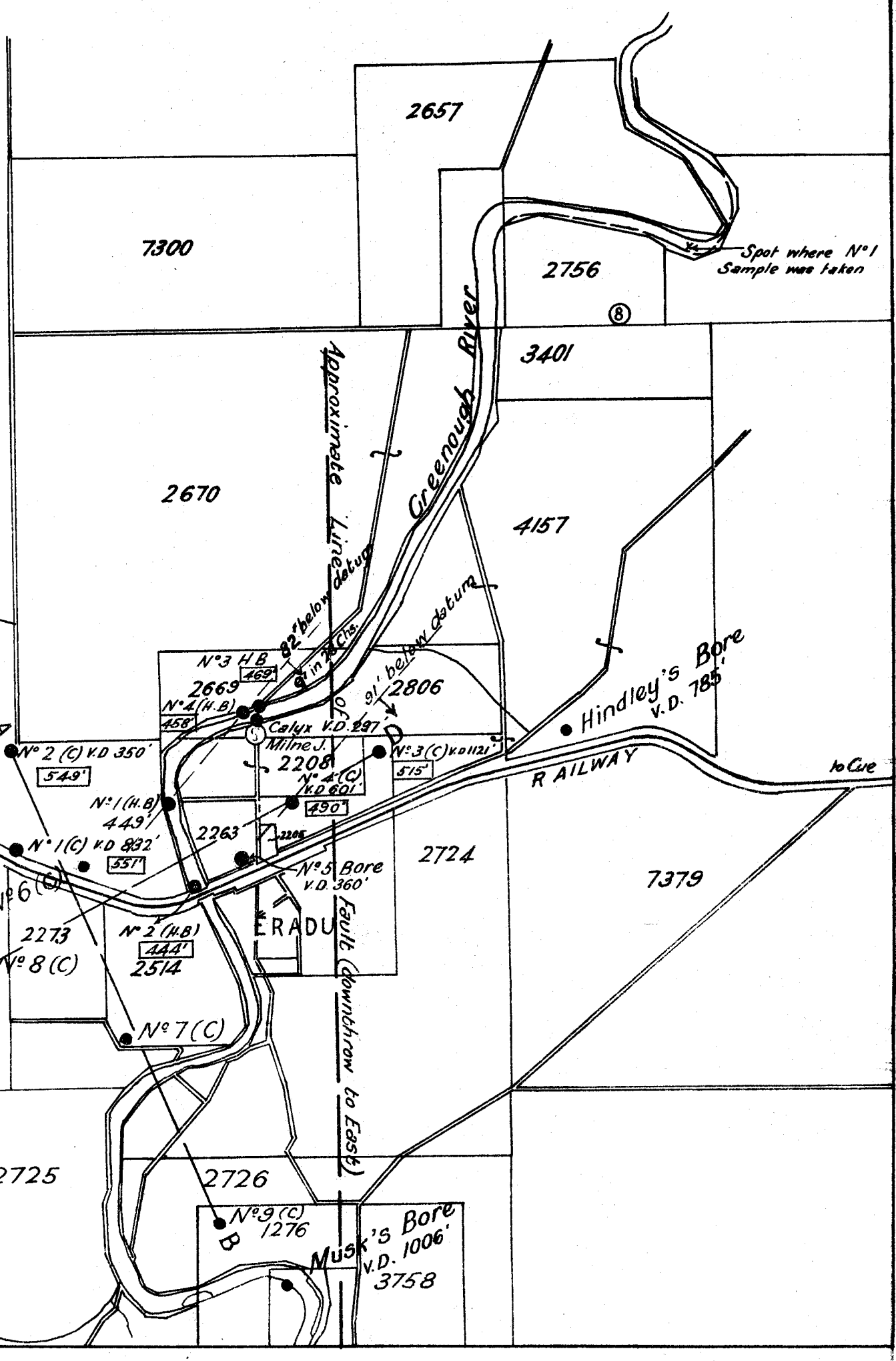
— AT —

— ERADU —

— Scale:- 40 Chains = 1 Inch —

— LEGEND —

⑥ Bore Sites Suggested
523' Height above Sea Level
(C) Calyx
(H.B) Hand Bore
(V.D) Vertical Depth



— Cross Sections —

— Eradu Coal Seams —

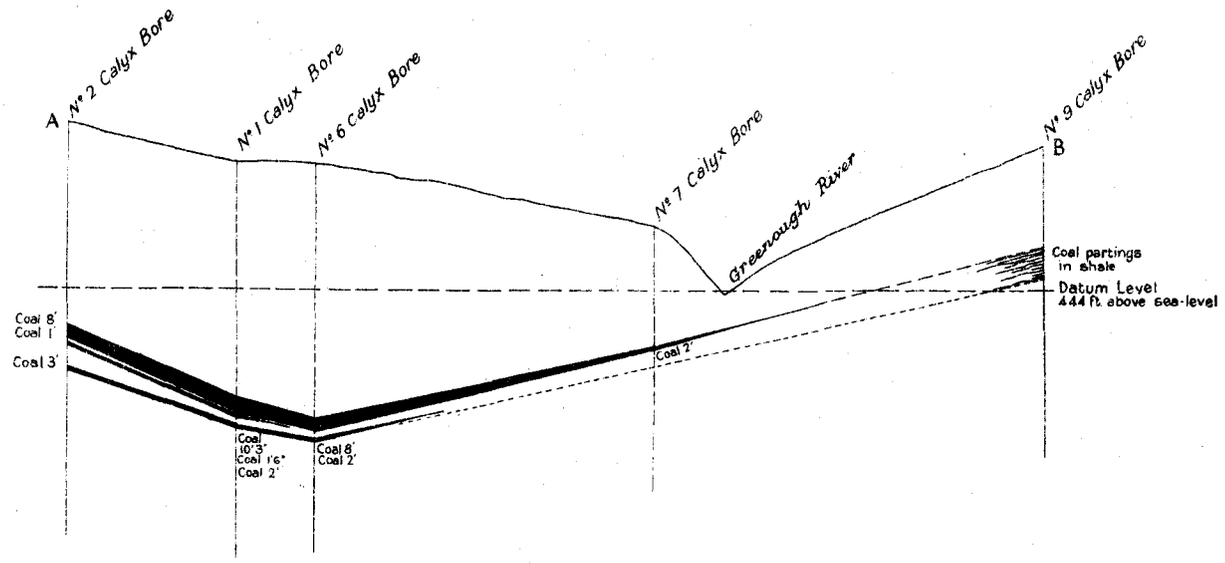
— on lines A-B & C-D of plan —

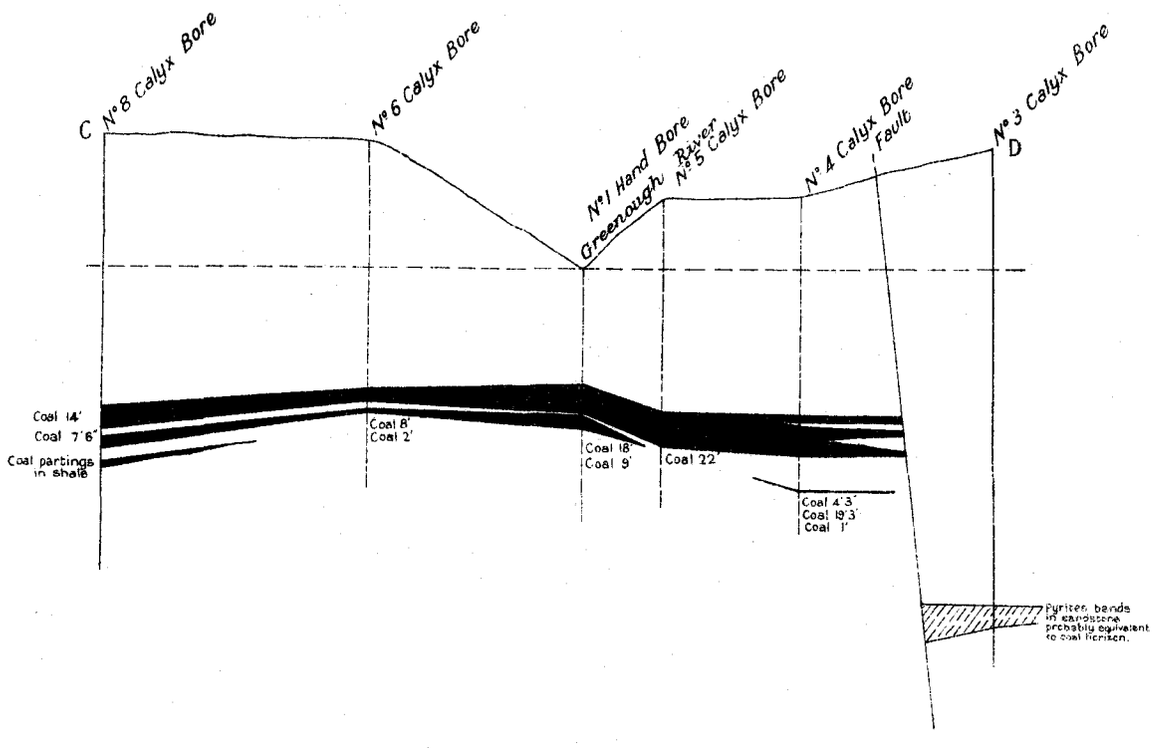
1000 0 1000 2000 3000 4000

— Horizontal Scale —

60 0 60 120 180 240

— Vertical Scale —





Compiled by F. Forman, B. Sc.

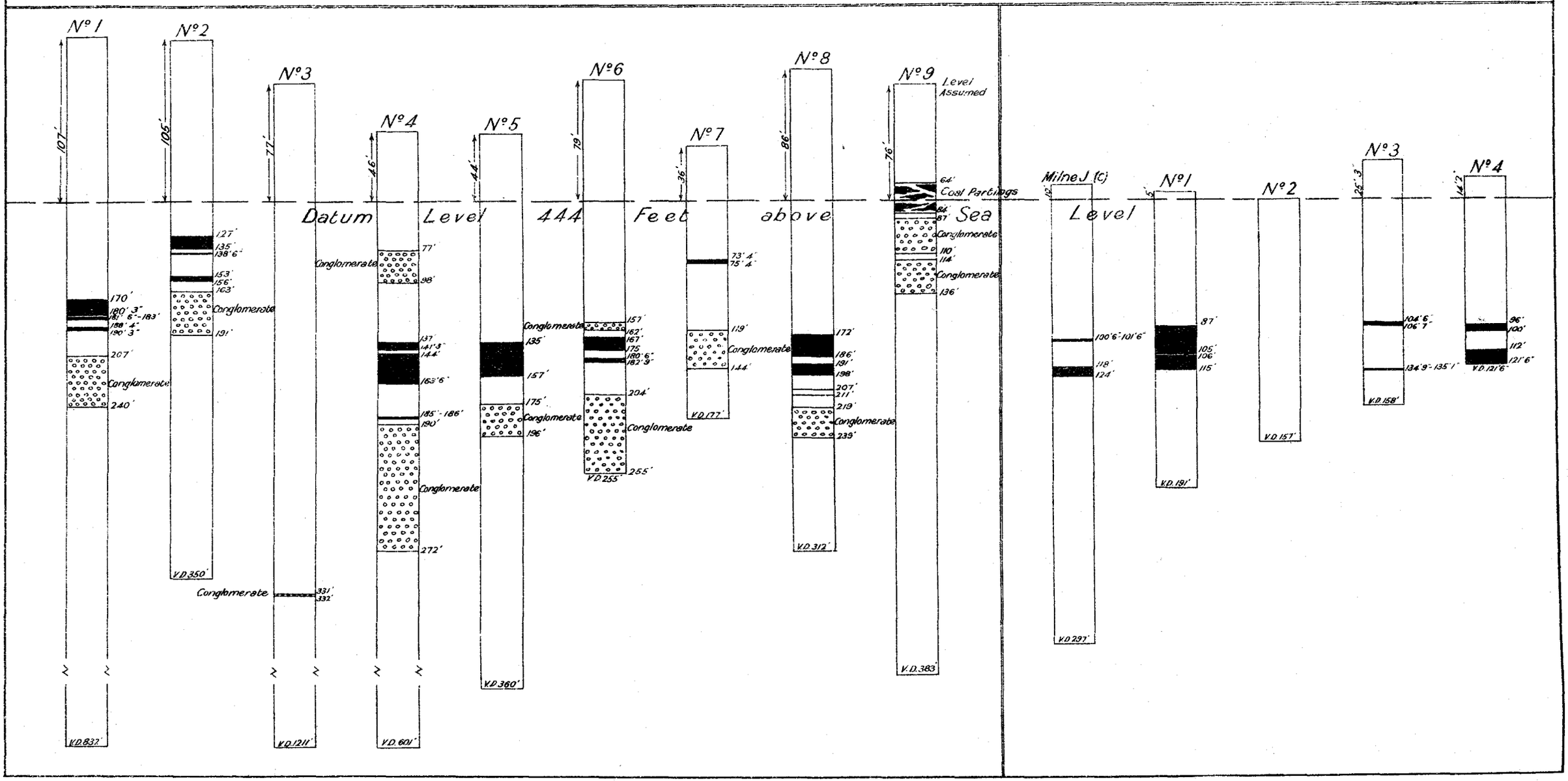
PLAN SHEWING SURFACE LEVEL OF BORES AT ERADU & THICKNESS & RELATIVE DEPTHS OF MAIN COAL SEAMS

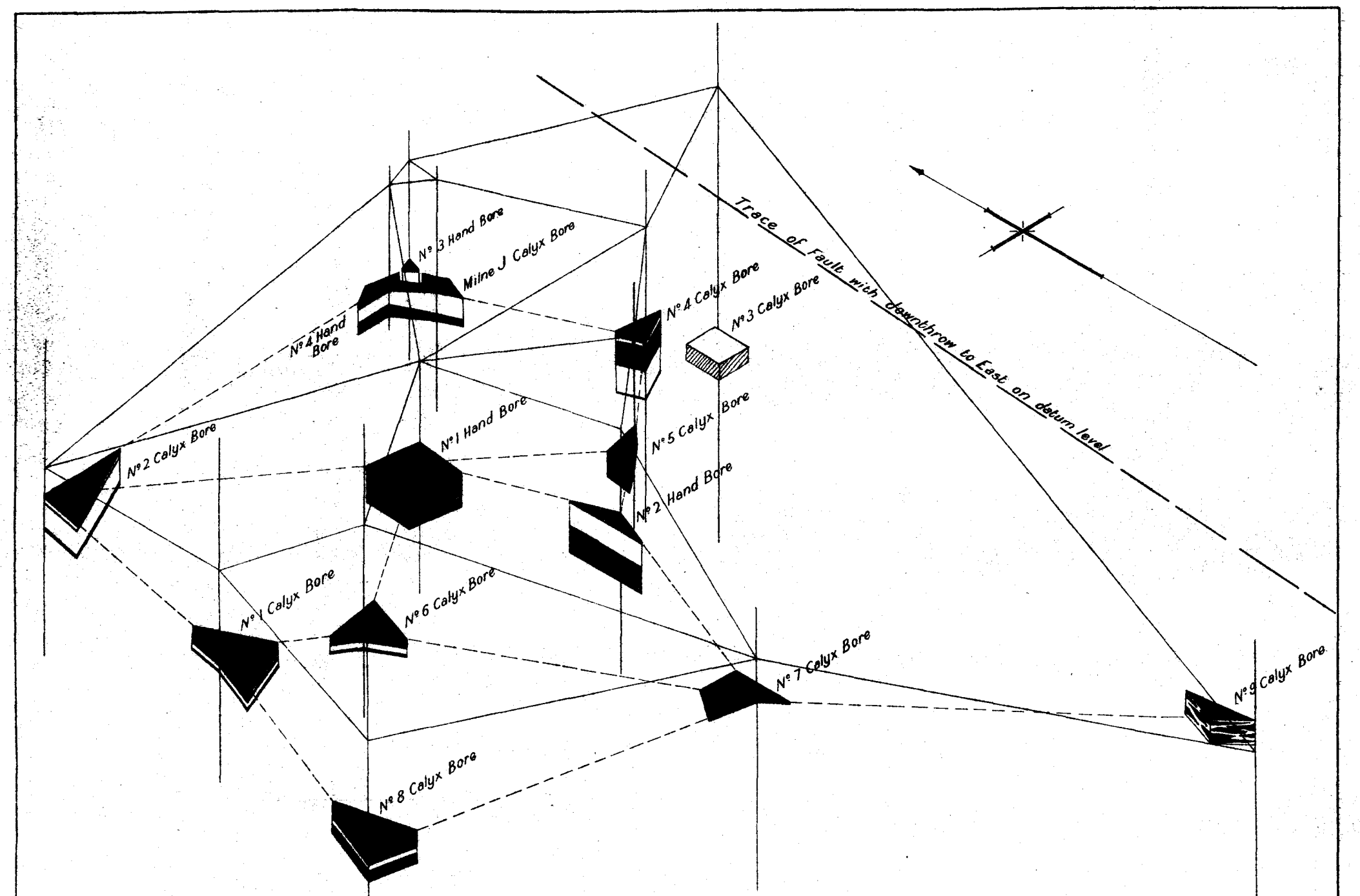
80 0 80 160

— Scale of Feet —

— Calyx Bores —

— Hand Bores —





— Isometric Drawing —

— Eradu Coal Bores —

— Horizontal Scale —

— Vertical Scale —

— LEGEND —

Full black line	Datum level 444 ft. above Sea level
Broken black line	Top of Coal horizon

No coal logged in Nos. 3 and 9 Bores
In N° 9 coal horizon marked by coal partings in shale
In N° 3 coal horizon marked by pyrites bands in shale

Compiled by F. Forman, B. Sc.

LOG OF BORE No. 3, ERADU.

Commenced 24th Oct., 1927—Completed 5th May, 1928.

Depth of Core. ft.	in.		ft.	in.	Description.
0	0	to	2	0	Sand.
2	0	,,	6	6	Red sandy loam.
6	6	,,	14	3	Hard ironstone.
14	3	,,	18	0	Ferruginous sandstone.
18	0	,,	21	3	Hard gray mudstone.
21	3	,,	31	0	Pink sandstone.
31	0	,,	33	6	Ironstone.
33	6	,,	40	6	Coarse ferruginous sandstone.
40	6	,,	43	0	Chocolate-coloured clay.
43	0	,,	44	0	Ironstone.
44	0	,,	68	6	Soft chocolate-coloured sandy clay.
68	6	,,	69	0	Ironstone.
69	0	,,	70	0	Chocolate-coloured sandy clay.
70	0	,,	71	0	Ironstone.
71	0	,,	74	0	Chocolate-coloured sandy clay.
74	0	,,	75	0	Very hard ironstone.
75	0	,,	90	0	Tough greasy chocolate-coloured clay.
108	0	,,	109	0	Very tough shaley clay.
109	0	,,	110	6	Carbonaceous shale.
110	6	,,	118	6	Gray sandy shale.
118	6	,,	120	0	Soft dark sandstone.
120	0	,,	141	6	Very fine light gray shale.
141	6	,,	150	6	Soft brown sandstone.
150	6	,,	151	6	Light gray shale.
151	6	,,	177	0	Soft brown sandstone.
177	0	,,	179	0	Light gray shale.
179	0	,,	255	0	Soft whitish sandstone with bands of white shale.
255	0	,,	256	0	Band of pyrites.
256	0	,,	288	3	Soft whitish sandstone with bands of white shale.
288	3	,,	289	6	Band of pyrites.
289	6	,,	293	6	Soft whitish sandstone with bands of white shale.
293	6	,,	296	1	Band of pyrites.
296	1	,,	300	0	Soft whitish sandstone with bands of white shale.
300	0	,,	301	3	Hard band of pyrites.
301	3	,,	320	8	Soft white sandstone.
320	8	,,	321	6	Very hard band of pyrites.
321	6	,,	326	0	Soft white sandstone with lumps of pryites.
326	0	,,	331	0	White sandy shale with pyrites.
331	0	,,	332	0	White sandy shale and rounded boulders.
332	0	,,	372	0	Soft black sandy shale.
372	0	,,	417	0	Soft dark sandstone.
417	0	,,	463	0	Very soft dark sandstone.
463	0	,,	465	0	Dark arenaceous shale.
465	0	,,	471	0	Soft dark sandstone.
471	0	,,	484	6	Dark arenaceous shale with pyrites.
484	6	,,	496	0	Soft dark sandstone.
496	0	,,	498	0	Dark arenaceous shale.
498	0	,,	506	0	Soft dark sandstone.
506	0	,,	507	0	Dark sandy shale.
507	0	,,	630	0	Very soft sandstone with shale bands.
630	0	,,	643	0	Soft dark arenaceous shale.
643	0	,,	768	0	Very soft fine sandstone with bands of shale.
768	0	,,	768	9	Band of pyrites.
768	9	,,	810	0	Tough dark shale.
810	0	,,	1,211	0	Tough dark shale with thin bands of mudstone.

LOG OF No. 4 COAL BORE AT ERADU.

Commenced 12th May, 1927.
Completed 21st Sept., 1927.

Depth of Core. ft.	in.		ft.	in.	Description.
0	0	to	11	0	Red loam.
11	0	,,	23	0	Ferruginous sandstone.
23	0	,,	25	6	Hard band of ironstone.
25	6	,,	27	6	Ferruginous sandstone.
27	6	,,	28	0	Band of ironstone.
28	0	,,	46	0	Ferruginous sandstone.
46	0	,,	77	0	White sandstone.
77	0	,,	98	0	Sandstone with boulders.
98	0	,,	107	0	Tough white mudstone.
107	0	,,	132	0	Soft sandstone.
132	0	,,	135	0	Sandy clay.
135	0	,,	137	0	Dark shale.

LOG OF No. 4 COAL BORE AT ERADU.—*continued.*

Depth of Core. ft.	ins.		ft.	ins.	Description.
137	9	to	141	3	Smutty coal.
141	3	,,	144	0	Dark shale.
144	0	,,	163	6	Smutty coal.
163	6	,,	169	0	Black shale with carbonaceous seams.
169	0	,,	185	6	Soft sandstone with pyrites.
185	6	,,	186	0	Coal.
186	0	,,	189	0	Fine grey sandstone.
189	0	,,	190	0	Dark shale.
190	0	,,	212	0	Soft white sandstone with small boulders.
212	0	,,	272	0	White sand with boulders.
272	0	,,	294	3	Soft white sandstone.
294	3	,,	334	6	Gray shale.
334	6	,,	337	0	Soft sandy shale.
337	0	,,	342	0	Gray shale.
342	0	,,	370	0	Soft dark sandstone.
370	0	,,	432	6	Soft dark sandstone with bands of shale.
432	6	,,	434	0	Dark shale.
434	0	,,	448	6	Soft dark sandstone with bands of shale
448	6	,,	453	0	Dark shale.
453	0	,,	510	0	Soft dark sandstone with bands of shale
510	0	,,	601	0	Soft dark sandstone.

PROXIMATE ANALYSIS AND CALORIFIC VALUE OF FOUR SAMPLES OF COAL FROM ERADU.

No. 4 Bore, Eradu.

Second seam cut at 144ft. Thickness of seam 19ft. 6in. Total length of core 12ft.

The core was divided into four equal portions of 3ft. each and sampled.

Lab. No.	1588/27 Top 3ft.	1589/27 2nd 3ft.	1590/27 3rd 3ft.	1591/27 Bottom 3ft.
Proximate Analysis:	%	%	%	%
Moisture ...	32·23	35·78	22·78	27·58
Volatile matter...	24·11	22·64	22·51	22·38
Fixed carbon ...	35·64	33·81	32·86	28·08
Ash	8·02	7·77	11·85	21·96
	100·00	100·00	100·00	100·00
Colour of Ash—Creamy white.				
Calorific Value—				
B.T.U	7028	6155	6310	Not determined.

Moisture determined on samples air-dried for two days after taking out of core boxes. Experiments are being made to see if the coal would dry still further on exposure to the air, as if the water percentage were lower the top half of the seam would be a fair commercial coal. As it is, it is of much better quality than any coal previously struck in the vicinity of Eradu.

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

Analyst: H. Bowley.

PROXIMATE ANALYSIS AND CALORIFIC VALUE—No. 4 BORE, ERADU.

Depth 137ft. Thickness 4ft. 3in.
No. 1858/27.
Sample air-dried for 19 days.

Proximate Analysis—		
Moisture	16·24	per cent.
Volatile matter ...	24·10	,,
Fixed carbon	31·91	,,
Ash	27·75	,,
	100·00	,,
Calorific Value—		
B.T.U.	5,742	

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

Analyst: H. Bowley.

No. 5 BORE FOR COAL AT ERADU.

Commenced 9th June, 1928.
Completed 14th July, 1928.

Depth of Core. ft.	in.		ft.	in.	Description.
0	0	to	2	0	Red loam.
2	0	,,	10	4	Yellow clay.
10	4	,,	14	0	Ferruginous sandstone.
14	0	,,	23	0	Brown clay.
23	0	,,	46	6	Ferruginous sandstone with clay lumps.
46	6	,,	47	2	Band of ironstone.
47	2	,,	108	0	White sandstone.
108	0	,,	112	0	White mudstone.
112	0	,,	119	0	Yellow sandstone showing streaks of a more ferruginous nature.
119	0	,,	130	8	Sandy clay ironstained.
130	8	,,	131	4	Dark sandy shale.
131	4	,,	135	0	Tough carbonaceous shale.
135	0	,,	157	0	Coal.
157	0	,,	162	0	Tough carbonaceous shale.
162	0	,,	166	0	Gray shale.
166	0	,,	169	0	Hard arenaceous shale.
169	0	,,	170	0	Coarse grained sandstone.
170	0	,,	175	0	Gray puggy shale.
175	0	,,	190	0	Sandstone with boulders.
190	0	,,	196	0	Conglomerate.
196	0	,,	199	0	Carbonaceous shale.
199	0	,,	207	0	Gray arenaceous shale.
207	0	,,	222	6	Soft gritty sandstone.
222	6	,,	292	0	Gray arenaceous shale.
292	0	,,	360	0	Soft dark sandstone with shale bands.

PROXIMATE ANALYSES—No. 5 BORE, ERADU.

Length of Core—17ft. 6in. Depth—135ft. to 157ft.

Lab. No. ...	1894 Top 3ft. 7in.	1895 Next 3ft. 7in.	1896 Next 3ft. 7in.	1897 Next 3ft. 7in.	1898 Bottom 3ft. 2in.
	%	%	%	%	%
Moisture ...	28·26	28·90	27·70	28·87	26·39
Volatile matter	21·96	21·31	20·85	23·07	22·16
Fixed carbon...	31·78	33·69	32·63	34·82	32·71
Ash	18·00	16·10	18·82	13·24	18·74
	100·00	100·00	100·00	100·00	100·00
Calorific Value ...	...	...	...	6649	...

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

Analyst: H. Bowley.

No. 6 COAL BORE AT ERADU.

Commenced 14th May, 1929.
Completed 4th June, 1929.

Depth of Core. ft.	in.		ft.	in.	Description.
0	0	to	13	0	Yellow surface sand with clay.
13	0	,,	93	0	Tough brown and chocolate clay with thin bands of soft sandstone.
93	0	,,	122	0	Soft white sandstone.
122	0	,,	144	0	Soft reddish sandstone.
144	0	,,	157	0	Conglomerate.
157	0	,,	162	0	Soft reddish sandstone with boulders.
162	0	,,	164	0	Gray clay,
164	0	,,	164	6	Ironstone band.
164	6	,,	167	0	Sandy clay.
167	0	,,	175	0	Coal.
175	0	,,	178	0	Gritty sandstone slightly argillaceous.
178	0	,,	180	6	Carbonaceous shale.
180	6	,,	182	9	Coal.
182	9	,,	192	9	Coarse-grained sandstone with bands of clay.
192	9	,,	193	3	Black shale.
193	3	,,	194	0	Carbonaceous shale.
194	0	,,	204	4	Tough gray shale.
204	4	,,	255	0	Coarse-grained sandstone with boulders

No. 7 COAL BORE AT ERADU.

Commenced 21st June, 1929.
Completed 2nd July, 1929.

Depth of Core. ft.	in.		ft.	in.	Description of Core.
0	0	to	3	6	Yellow sandy loam.
3	6	,,	32	0	Yellow sandy clay.
32	0	,,	44	0	Soft white sandstone.
44	0	,,	51	0	White sandy clay.
51	0	,,	66	0	Soft yellow sandstone.
66	0	,,	72	0	Chocolate and gray clay.
72	0	,,	73	4	Dark shale.
73	4	,,	75	4	Coal.
75	4	,,	79	8	Gray shale.
79	8	,,	90	4	Coarse-grained white sandstone.
90	4	,,	93	0	Gray shale.
93	0	,,	112	0	Coarse-grained gray sandstone.
112	0	,,	113	0	Gray shale.
113	0	,,	119	0	Coarse gray sandstone.
119	0	,,	144	0	Gray sandstone with boulders.
144	0	,,	147	0	Gray sandstone with bands of shale.
147	0	,,	177	0	Coarse gray sandstone.

No. 7 BORE, ERADU.

Depth—73ft. 4in. to 75ft. 4in.

No. 2939/29.

Carbonaceous shale.

Proximate Analysis :—

Moisture	31·50	per cent.
Volatile hydrocarbons and combined water	23·20	,,
Fixed carbon	13·37	,,
Ash	31·93	,,
	100·00	,,

Analyst: D. G. Murray.

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

No. 8 COAL BORE, ERADU.

Depth of Core. ft.	in.		ft.	in.	Description of Core.
0	0	to	4	0	Sand.
4	0	,,	18	0	Yellow sandy clay.
18	0	,,	36	6	Yellow sandstone.
36	6	,,	71	0	White sandstone.
71	0	,,	76	0	Soft brown sandstone.
76	0	,,	105	9	Soft white sandstone.
105	9	,,	110	3	Soft white sandstone with bands of white clay.
110	3	,,	140	0	Soft white sandstone.
140	0	,,	162	0	Pink sandstone.
162	0	,,	165	0	Brown sandstone.
165	0	,,	166	6	Hard ironstone band.
166	6	,,	169	0	Soft red sandstone.
169	0	,,	172	0	Chocolate clay.
172	0	,,	186	0	Coal.
186	0	,,	190	0	Chocolate clay.
190	0	,,	191	0	Black shale.
191	0	,,	198	6	Coal.
198	6	,,	207	0	Tough gray shale.
207	0	,,	211	0	Carbonaceous shale with coal partings.
211	0	,,	215	0	Tough gray shale.
215	0	,,	219	0	Fine sandstone.
219	0	,,	239	0	Gritty sandstone with boulders.
239	0	,,	241	0	Sandy shale.
241	0	,,	312	0	Soft dark sandstone with bands of shale.

No. 8 BORE, ERADU.

Lab. No.—3789/29.

No. 1 Seam.—Depth 172ft. to 186ft. Core—2ft.

Proximate Analysis :

Moisture	23·30	per cent.
Volatile hydrocarbons ...	25·08	,,
Fixed carbon	21·44	,,
Ash	30·18	,,
	100·00	,,

No. 2 Seam.—Depth 191ft. to 198ft. 6in. Core 7ft.
Divided into three equal sections—

Lab. No.	3790/29 Top Section.	3791/29 Middle Section.	3792/29 Bottom Section.
Proximate Analysis—	%	%	%
Moisture	22·21	22·93	15·21
Volatile Hydrocarbons	22·11	24·14	21·79
Fixed Carbon ...	33·63	36·53	20·79
Ash	22·05	16·40	42·21
	100·00	100·00	100·00

Analyst: H. Bowley

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

No. 9 COAL BORE AT ERADU.

Commenced 16th September, 1929.
Completed 16th October, 1929.

(Surface approximately 50ft. above surface at No. 7 Bore.)

Depth of Core. ft.	in.		ft.	in.	Description.
0	0	to	2	0	Ironstone gravel.
2	0	,,	8	0	Clay with ironstone boulders.
8	0	,,	10	0	Hard ironstone.
10	0	,,	44	0	Yellow clay with ironstone boulders.
44	0	,,	48	0	Yellow sandy clay.
48	0	,,	59	0	Fine pink and yellow sandstone.
59	0	,,	64	0	Coarse soft sandstone.
64	0	,,	84	0	Carbonaceous shale with coal bands.
84	0	,,	87	0	Soft sandy yellow clay.
87	0	,,	110	0	White sandstone with rounded boulders.
110	0	,,	114	0	Brown shale.
114	0	,,	136	0	White sandstone with rounded boulders.
136	0	,,	137	6	Gray shale.
137	6	,,	159	0	White sandstone.
159	0	,,	176	0	Black shale.
176	0	,,	196	0	Soft fine grey sandstone.
196	0	,,	202	0	Soft coarse grey sandstone.
202	0	,,	383	0	Dark sandstone with bands of shale.

NOTE.—Carbonaceous shale 64-84ft. not analysed.

In addition to the logs, plans and sections showing the locality of the bores, dip of the coal seams and conglomerate beds, and reduced levels of the bore holes are also attached.

The data so far obtained from these nine bores have definitely proved that the dip of the coal in the area tested is irregular, and that there is considerable troughing, also that the coal beds are more or less lenticular.

The failure to obtain coal in No. 3, Hindley's and Musk's bore, may be due to tailing out of the coal seam, but more probably to a fault striking parallel with the general direction of the course of the river. The general direction of the dip of the coal may, however, be safely regarded as being towards the south-east with a north-east, south-west strike. Owing to the absence of definite coal seams in the deep bores, No. 3, Hindley's and Musk's, also the deep bores still further east at the 47½ mile post, any future boring would best be carried out to the north-west to ascertain whether there may not be coal seams at deeper horizons, or to test by shallow bores, first the country lying at least several miles to the south-east and look for fresh seams where there are strong indications of coal occurring.

The most disappointing aspect of the recent boring is the high percentage of ash and moisture in the coal itself, and the fact that none of the seams have reached even the grade of that found originally in the river calyx bore which was distinctly encouraging.

Of the present series only one is worthy of consideration, viz., the top section of the seam found in No. 4 bore which gave a calorific value of 7028 B.T.U.

REPORT ON THE REPUTED DISCOVERY OF A STRUCTURE SUITABLE FOR BORING IN SEARCH OF OIL, BYRO PLAINS (South of the Wooramel River).

F. R. Feldtmann, Field Geologist.

In accordance with instructions from the Under Secretary for Mines, I accompanied Dr. Woolnough, Geological Adviser to the Commonwealth Government, and Mr. H. W. B. Talbot, to Byro Plains, immediately south of Wooramel River and near the southern end of the North-West Artesian Basin. Mr. Talbot, who had made a geological examination of the area, with a view to its oil-bearing possibilities, on behalf of a Perth Syndicate, had reported the discovery of a dome structure, suitable for a a bore site, at a point about 5½ miles south of Survey Station R25 on Wooramel River (Lands Department Litho. 73/300), and about 15 miles W.S.W. of Bogadi outcamp on Byro Station. The object of the trip was to confirm, or otherwise, Mr. Talbot's observations.

Except for brief reconnaissance trips by H. P. Woodward and A. Gibb Maitland, this area has not been examined by officers of the Geological Survey and no detailed geological mapping has been done. The approximate eastern boundary of the Permo-Carboniferous rocks occupying the area, compiled from Mr. Maitland's notes, was shown on the geological maps of the State published in 1919 and 1920, but observations made during the recent trip indicate that the boundary south of the Wooramel River is somewhat farther west than is shown on these maps. Broad mapping of the area between Sandford and Wooramel Rivers is desirable. In the vicinity of Wooramel River the eastern boundary of the Permo-Carboniferous rocks is probably a short distance east of the Stock Route.

Notes made by Mr. Maitland, and the observations of Dr. Woolnough, Mr. Talbot and myself, show that the area east and south-east of the Permo-Carboniferous rocks is occupied partly by granite, partly by ferruginous quartzites resembling the jaspers of the Goldfields, but possibly belonging to the Mosquito Creek Series, and these rocks probably mainly form the floor on which the Permo-Carboniferous sediments were laid down. Mr. Talbot, whose experience of the Nullagine Series is greater than that of any other geologist, is of the opinion that Mt. Rebecca, about 9½ miles west of the Byro homestead, consists of quartzite of the Nullagine type and similar quartzite dipping west at about 20° was noted during the recent trip on Earlier Hill, 7½ miles N.N.E. of Mt. Rebecca and about half way along the track between Byro homestead and Mearearbundie outcamp. These hills were formerly included in the Permo-Carboniferous area. It is possible, therefore, that in places the Permo-Carboniferous rocks are underlain by sediments of the Nullagine Series, separating them from the older granite and Mosquito Creek Series.

The area examined consists of an almost level plain extending east and west for several miles,

partly enclosed by low breakaways and broken in places by buttes and small mesas capped by laterite. Outcrops are fairly common, even on the flat, but are masked, to some extent, by debris in which occasional rounded pebbles, probably glacial erratics, occur.

The Permo-Carboniferous rocks of Byro Plains consist of sandstones, and to a minor extent, grits; dark-grey shales, in which are thin bands of gypsum in places; and limestones. Fossils,§ including various species of spirifers, are numerous in places, particularly in the bed of Wooramel River.

The dip of the Permo-Carboniferous rocks is very low. In the eastern portion of the area the prevailing dip, according to Mr. Talbot's observations, is E.S.E. at about 2°-3°, except in the extreme east, near the margin where the dip is westward, but in the western portion the dips are in directions approximately radiating outwards from the point located by Mr. Talbot.

The total thickness of the Permo-Carboniferous rocks in the Byro area has not been determined. Four bores have been put down for Messrs. Darlôt Bros. in this area, in search of water: No. 1 Bore, at Bogadi outcamp to a depth of 1,253 feet; No. 2 (Boolgarloo Bore), about 8 miles west of Murray Peak, to a depth of 2,218 feet; Bindalya Bore, about 6½ miles south of Bogadi to a depth of 235 feet; and Breakaway Bore, 4 miles south of Bindalya Bore and about 6½ miles N.E. of Murray Peak, to a depth of 303 feet.

According to the logs these bores are entirely in sedimentary rocks, consisting mainly of sandstones and shales, 1,155 feet of shales being stated to occur in No. 1 Bore between 45 feet and 1,200 feet, the remainder of the bore being in sandstone. A large supply of brackish water, which rose to 120 feet from the surface, was struck in this bore at 1,160 feet. In No. 2 Bore, 185 feet of black shale was stated to occur between the depths of 45 feet and 230 feet, and approximately 64 feet of shale between 1,961 feet and 2,025 feet. Highly saline water was encountered at 80 feet, and between 2,090 feet and 2,101 feet salt water, which rose to 141 feet from the surface, was encountered. The determinations of the last 9 feet of this bore are somewhat doubtful, and it is possible that this portion is in the older rocks.

The Bindalya and Breakaway bores are stated to be entirely in sandstone except for about 2 feet of black sand at the bottom of Breakaway Bore.

The only specimens from these bores in the possession of the Survey are fragments from between 490 feet and 1,230 feet from No. 1 Bore, and a specimen of purplish-grey ferruginous sandstone, weathering to a pale yellowish grey with traces of fossil cavities from 1,170 feet in No. 2 Bore.

Between 490 feet and 1,150 feet the No. 1 Bore specimens consist entirely of dark grey shale, in part reduced to clay. Fragments from between 1,150 and 1,170 feet consist of fine-grained compact pale grey sandstone, and the depth between 1,170 feet and 1,230 feet is represented by loose, fine apparently clayey sand, probably from argillaceous sandstone. The occurrence of sandstone between 1,150 feet and 1,170 feet reduces the total thickness of shale in No. 1 Bore to 1,105 feet.

In 1924, the North-West Artesian Basin was examined by Dr. F. G. Clapp, the American oil geologist, on behalf of Mr. A. E. Broué, of Sydney. Dr. Clapp summed up the possibilities of the basin as follows: * "Not a trace of oil is known ever to have been found in any of the two score artesian wells drilled between one and three thousand feet deep. Only traces of natural gas have been reported in any of them, and these could not be substantiated at the time of the writer's inspection. So far as observed, the shales in North-West Basin are entirely inadequate to act as a suitable cover to hold oil in the thousands of feet of sandstones that exist there, even if oil ever existed in these rocks. Sources of origin may have existed but are of theoretical interest only. Structures exist, but these are inconsequential, since other fundamental conditions are unfavourable."

Dr. Clapp includes a list of artesian bores put down in the basin, but does not include those of Byro Station, of the existence of which he was apparently unaware. He dismissed the records of shales in the bores with the statement † that : "in the region any fine-grained material is generally termed 'shale,' hence such reports were not considered important from the standpoint of oil occurrence."

Conclusions.

The examination of the area by Dr. Woolnough and myself confirms the existence of a dome structure at the point located by Mr. Talbot. The records of the bores put down on Byro Station indicate that a considerable thickness of shale suitable to form a cover for oil-bearing strata, should such exist, occurs in this area, and in addition to the exposures noted on Mr. Talbot's map, weathered fragments of shale were noted in places by Dr. Woolnough and myself. On the other hand, no trace of gas or other evidence of oil has been reported from the bores. These, however, are situated at considerable distances from the dome, and, moreover, the total thickness of the sedimentary rocks is unknown.

The Permo-Carboniferous rocks have been faulted subsequently to their deposition. Two faults are shown on Mr. Talbot's map, one a short distance east of Survey Station R20 striking N.N.E. and dipping E.S.E. at 65°, and one west of Callytharra Spring striking W.N.W. and dipping S.S.E. A third well-marked fault which had previously escaped Mr. Talbot's notice was observed, during the recent visit, north of the dome. This fault strikes on the average about N. 29°E., and dips between 70 and 80° W.N.W. It must pass very close to the crest of the dome. The throw of these faults has not been determined and their effect on underlying oil pools, should such ever have existed, is unknown.

Although a dome structure undoubtedly exists at the point located, in my opinion further detailed geological and topographical work in this area, with the object of locating other favourable structures and such faults as may exist, is advisable before boring is undertaken.

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* Clapp, F. G.—Oil prospects of the North-West Basin of Western Australia. Bull. Am. Inst. Pet. Geol., Vol. 10, No. 11, p. 1,149.

† op. cit., p. 1,148.

§ List of Fossils collected by H. W. B. Talbot and F. R. Feldtmann from the Wooramel River District, W.A., in March, 1929, and identified by Miss L. Hosking, B.A., of the University of W.A., is appended at the end of the Report (p. 113).

NOTES ON THE GEOLOGY AND PETROLEUM PROSPECTS OF THE DESERT BASIN OF W.A.

F. G. Forman, B.Sc.

The writer, having recently returned from an observational tour of some of the leading petroleum-producing centres of the United States of America, it was suggested by the Government Geologist that he comment on the Geology and Petroleum Prospects of the Desert Basin, in the light of the most recent discoveries in that area, and from information obtained in actually producing areas. It is with these points in mind that the following notes are written.

The Desert Basin Area is physiographically and geologically described by Mr. Blatchford in Bulletin 93,* but it is thought best to give a brief description of these features in order that the discussion which is to follow may be more easily understood.

The Desert Basin of W.A.† is an extensive peneplain over 125,000 sq. miles in area. It is bounded on the north-east and east by the King Leopold Plateau; on the south-east and south by the interior plateau of the Eastern Division; and on the north and north-west by the Indian Ocean, from Swan Point on the north to Wallal on the south.

The principal streams in the area are the Fitzroy River and its tributaries, draining most of the southern flanks of the northern tableland, and finally discharging into King Sound. The remainder of the area is practically without rivers or permanent surface waters of any kind, and consists mainly of sand ridge country bearing a growth of sturdy desert grass or spinifex.

Structurally the Desert Basin is a geosynclinal unit, occupied by rocks of Upper and Lower Carboniferous age, which are probably underlain by Devonian strata, and cover up an extension of the Cambrian rocks of the Ord Basin.

The junction of the Carboniferous rocks of the Basin with the Cambrian and other rocks of the King Leopold Plateau is marked by an extensive fault which can be traced for a distance of over 200 miles and having a vertical displacement of some 2,000 feet near Price's Creek in the Rough Range. On the south-east, south and west the Basin sediments give way to the metamorphic rocks of the Nullagine Formation, while along the coastal strip they are overlain by sediments of Jurassic age, which in turn are covered, in places, by late Tertiary formations.

Taking the Basin as a whole, rock exposures are very few and widely scattered. In the greater part of the area, especially towards the inner portions, the solid rock is covered by thick deposits of wind-blown sand, which effectively hide the dip; and except where widely scattered and small more resistant areas stand above the general level of the plain, the unravelling of geological conditions by surface observations is an almost hopeless task.

Surface dips indicate that there is a regional dip basinwards. There are minor folds of an anticlinal nature close to the north-east fringe of the Basin, while in the valleys of the Fitzroy River and Christmas Creek a second line of major folds has been mapped.

The Carboniferous rocks of the Basin may be divided on lithological grounds into three groups. The Upper or Poole Range Beds consisting of sandstones and occasional shale beds, now found only on the higher ridges capping the lower strata. They are distinguished by their peculiar form of weathering into conical, rather than flat-topped, hills.

Beneath the Poole Range Beds and making with them a conformable junction are the Grant Range Beds, consisting of rather coarse-grained sandstones interbedded with extensive shales and minor fossiliferous limestone beds. In several localities distinct beds of tillite, containing glaciated boulders, have been noted; while false bedding of the sediments and ripple marking are not uncommon. This series has a proved thickness of over 2,000 feet.

The Poole Range and the Grant Range Beds lie unconformably on the Upper Limestone members of the Lower Carboniferous rocks. The Lower Limestones, where examined at exposures, are massive—though at times well bedded—and are rich with fossil remains, chiefly of coral, polyzoa and other types.

At several localities in the Fitzroy Basin the sediments have been intruded by leucitite lavas in the form of volcanic necks or elongated vents. The largest of these has a length of some twenty chains. The leucites are considered to be of Tertiary age owing to their close correspondence to similar intrusions of that age in Java.

The strata of Jurassic age, which overlie the lower rocks along the sea front, need not be further considered as they are of no importance in the present discussion.

There have been, at least, two important earth movements which affect the Basin. The first of these was the rise of the King Leopold Plateau with a corresponding subsidence and faulting of the flanks. The second and much later movement was the general subsidence of the plateau giving the Carboniferous basin its present synclinal form, and causing the development of folding and minor faulting. These movements have caused the development of two series of folds: one minor series close to the main fault on the north-east edge of the Basin, the second and more pronounced series at some distance from the Basin rim, close to the Fitzroy River and Christmas Creek.

A good example of the minor series of folding is seen in the structure which has been mapped by Talbot in the Lower Limestone Beds at Price's Creek. Examples of the second occur at Grant Range, Mount Wynne, St. George Range, Poole Range, and others recently discovered, one south of Mt. Erskine and a second close to Godfrey's Tank on the Canning Stock Route.

Amongst petroleum geologists of the present day it is agreed that certain fundamental criteria for oil occurrence must be reasonably satisfied before a new area can be considered, with any degree of optimism, as a likely place for the development of an oil field.

These fundamental criteria ‡ may be set down as follows:—

1. Do "surface indications" (seepages, etc.), exist?
2. Are the rocks of sedimentry origin?
3. Is the age of the strata (in part at least) similar to that prevailing in some known oil or gas field?
4. Does a possible source of origin exist? If this be not apparent, may it nevertheless be present?
5. Do porous beds or reservoirs exist in which oil may be held in commercial quantities?

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* G.S. W.A., Bulletin 93—"The Geology of Portion of the Kimberley Division with special reference to the Fitzroy Basin and the Possibilities of Occurrence of Mineral Oil," by T. Blatchford, B.A. (1927).

† Map I. For detailed map of area *see* Bulletin 93.

‡ Bulletin A.A.P.G., Vol. II., No. 7 (1927)—"Fundamental Criteria for Oil Occurrence," by F. G. Clapp.

6. If so, does sufficient cover exist above those beds to prevent oil or gas from escaping to the surface and from being lost?
7. Are the strata so slightly metamorphosed by heat or pressure that the oil has presumably not been driven away?
8. Does geological structure exist suitable for concentrating oil or gas in commercial quantity?
9. Are the hydrostatic conditions such as may not prohibit the accumulation of oil in pools?

Applying the above criteria to the Desert Basin, we find that they are all either definitely satisfied or that there is no great doubt of their so being.

Condition 1 does not cause any difficulty. Although only one small surface seepage is reported, from Price's Creek, the absence of extensive surface seepages simply indicates that beds containing much oil have not been exposed at the surface or that faulting has not been intensive enough to cause loss of oil from deeply buried reservoirs.

Conditions 2 and 3 are definitely satisfied, as we have in the Desert Basin an area of over 125,000 sq. miles composed almost entirely of sediments of Carboniferous and possibly Devonian age, corresponding to the producing areas of the Mid-Continent Oil Field of the United States of America and of other producing areas.

Possible sources of origin exist in the abundant limestones of both the Upper and Lower Carboniferous strata. Shale beds also have an extensive existence in the strata and may also be considered a possible source. However, any lengthy discussion of this problem seems unnecessary, as undoubted shows of petroleum have already been recovered from the strata of this area. Traces of bitumen and heavy oil were noted in bores put down in the Upper Carboniferous rocks at Mount Wynne. At Price's Creek undoubted oil shows have been obtained from bores in the lower Carboniferous sandstone. Fair showings of heavy mineral oil have also been obtained from the Upper Carboniferous formations at a depth of about 2,000 feet in the Freney Kimberley Oil Company's bore at Poole Range.

For porous reservoir rocks we need only look as far as the extensive sandstones of the Carboniferous beds. These undoubtedly have the requisite porosity as they yield abundant flows of artesian water.

Efficient cover beds are provided by the extensive shale zones which have been cut in most of the bores put down in search for oil. The presence of shales of sufficient extent to form an effective seal to prevent the upwards migration of the oil has been doubted by several geologists who have visited the area. There now appear to be no grounds for such doubts, as extensive shale beds have definitely been shown to exist. As an indication of their thickness a bore put down on "Cherabin" Station, close to the St. George Range, might be mentioned; this bore having passed through several hundred feet of shales.

The metamorphism of the rocks of the Desert Basin has gone no further than the normal compaction and cementation of sandstones and the formation of normal shales from marine muds and oozes. The injection of the Tertiary leucite has caused baking of the rocks in their immediate vicinity, but as this metamorphic action does not extend beyond the immediate vicinity of the leucite pipes it can have no adverse effect on the petroleum possibilities of the Basin sediments as a whole.

Every geologist who has visited and critically examined the structures in the Fitzroy River and Christmas Creek area has agreed that the structures are excellent, with, so far as can be determined by examination of surface outcrops, a satisfactory closure on all sides.

The question of hydrostatic condition of the reservoirs is probably the one on which there is at the present time least positive information. This question is an important one; as, unless the structures have sufficiently big closures to prevent the removal of their petroleum contents by flushing due to the circulation of underground water, which undoubtedly exists, there is every chance of the greater part of the petroleum contents having disappeared from the structures.

The behaviour of the water in the Freney Kimberley Oil Company's Poole Range bore throws some light on this question. On one occasion when undoubted oil sands were pierced by the drill and oil shows obtained, the water in the bore fell some fifteen or sixteen feet, finally building up to its normal level. This fact seems to indicate that the pressure within the oil sands was less than that of the column of artesian water above. This being so, it seems impossible that the water above could have had access to the oil sands below, otherwise their pressure conditions would have been the same. This seems to indicate that the hydrostatic conditions in the oil sands already penetrated, are favourable.

Certain visiting geologists have, after a reconnaissance of parts of the Desert Basin, held out very little hope of oil being obtained in commercial quantities in this area. While all agreed that excellent structures existed, several were not satisfied by the evidence available to them that the other fundamental conditions were reasonably satisfied. With the facts as they are now known, it seems hardly likely that these men would not reconsider the whole question.

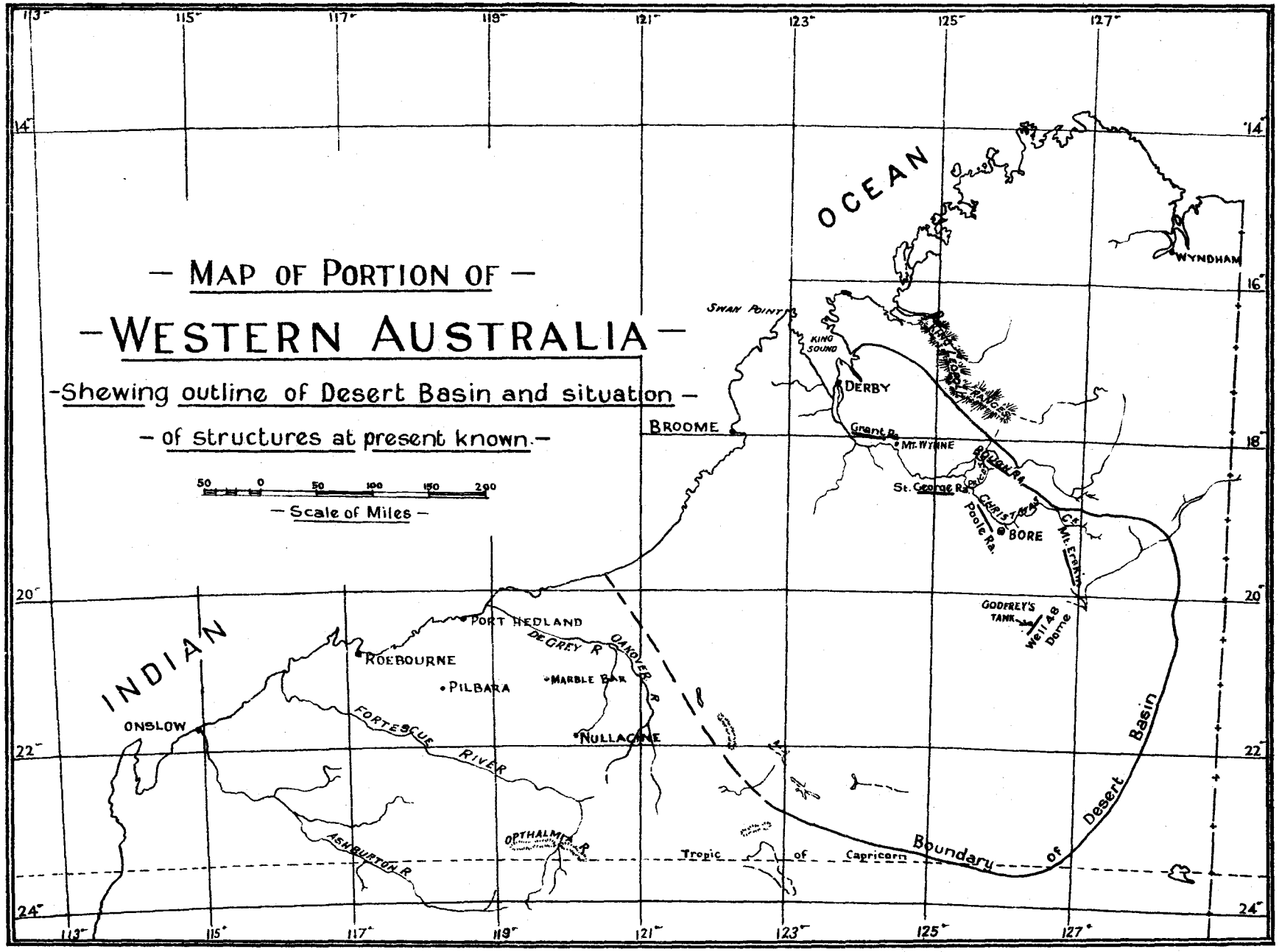
Maps 2 and 3 show the outlines of two basin structures, one the West Texas Permian Basin, the other the Big Horn Basin of Cretaceous age in Wyoming. Both these areas contain commercial oil pools and it will be at once noticed that the producing structures in each case lie on general lines in the basin, which are roughly parallel to the rim. Many other similar examples could be quoted but these two should serve to illustrate the point.

In sedimentary basins the existence of axes of folding roughly parallel to the basin edge is to be expected, as a consequence of the forces brought into action at the time of the formation of the main synclinal form.

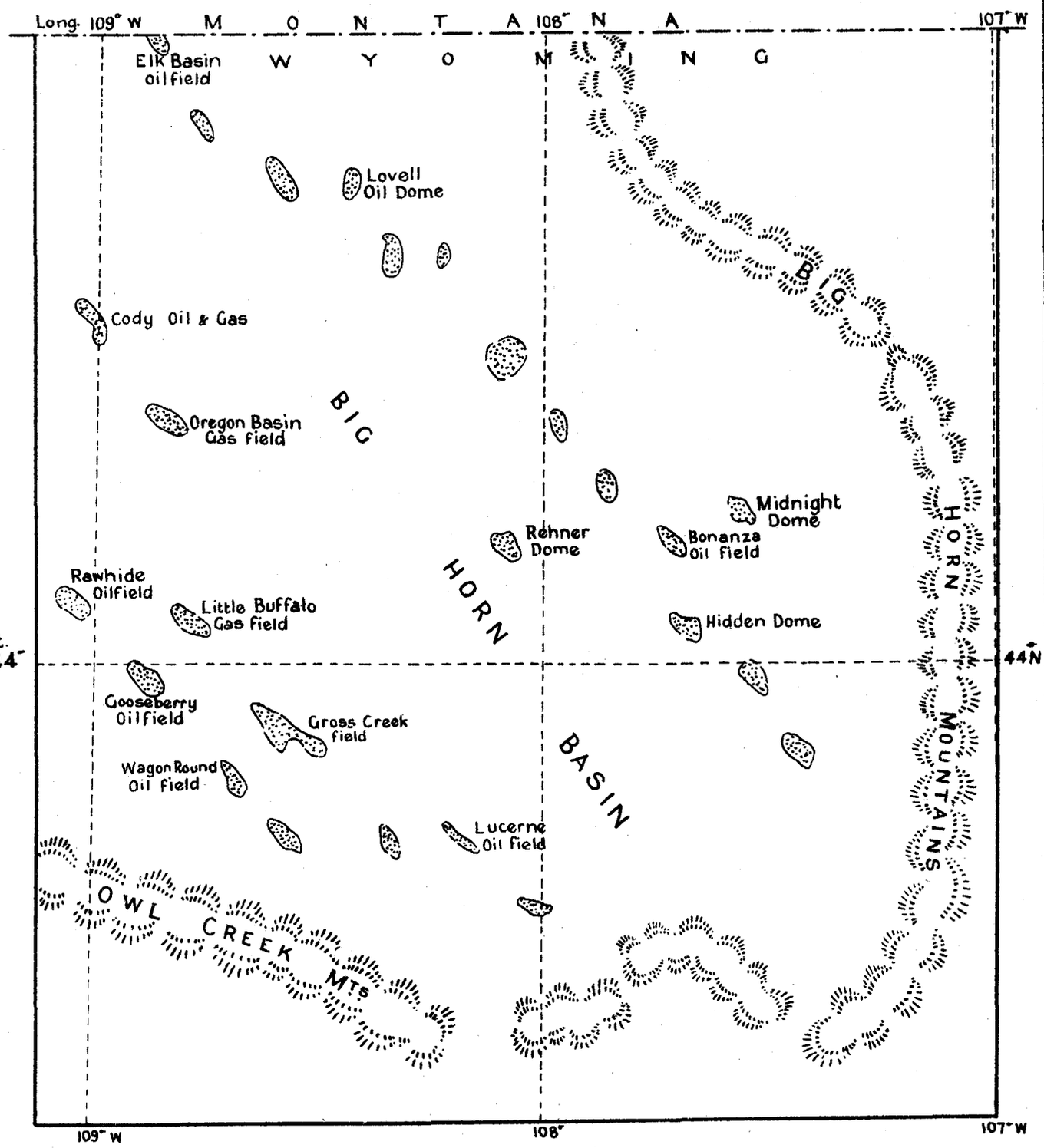
Blatchford has noticed the marked parallelism of the major line of foldings to the main fault line on the north-east edge of the Desert Basin, and recent investigations by him have led to an extension of this line of folding as far south as Mt. Erskine. A structure still further south has been located by Leo. J. Jones *1¾ miles east of No. 48 Well, Canning Stock Route.

Detailed examination of the Desert Basin for reservoir conditions has so far been practically confined to a strip of country 250 miles long by about 90 miles wide, on the north-east edge of the Basin. This leaves the whole of the southern and western parts of the

* "Report on Petroleum Prospecting Area 21H," by Leo J. Jones, Geologist. Geological Survey of New South Wale


— MAP OF PORTION OF —
— WESTERN AUSTRALIA —
-Shewing outline of Desert Basin and situation —
— of structures at present known —
50 0 50 100 150 200
— Scale of Miles —
OCEAN
INDIAN
SWAN POINT
KING SOUND
WYNDHAM
DERBY
BROOME
Grant Ra.
Mt. WYNNE
St. George Ra.
Poole Ra.
BORE
Mt. Ernest
GODFREY'S TANK
Well 48
Dome
PORT HEDLAND
DE GREY R.
OANOVER R.
ROEBOURNE
PILBARA
MARBLE BAR
ONSLOW
FORTESCUE RIVER
NULLAGINE
ASHBURTON R.
OPTHALMIA R.
Tropic of Capricorn
Boundary of Desert Basin
113°
115°
117°
119°
121°
123°
125°
127°
14°
16°
18°
20°
22°
24°

— Sketch Map —
PART OF
— BIG HORN BASIN —
— WYOMING —
— Shewing general parallelism of Oil —
— fields to Basin rim. —

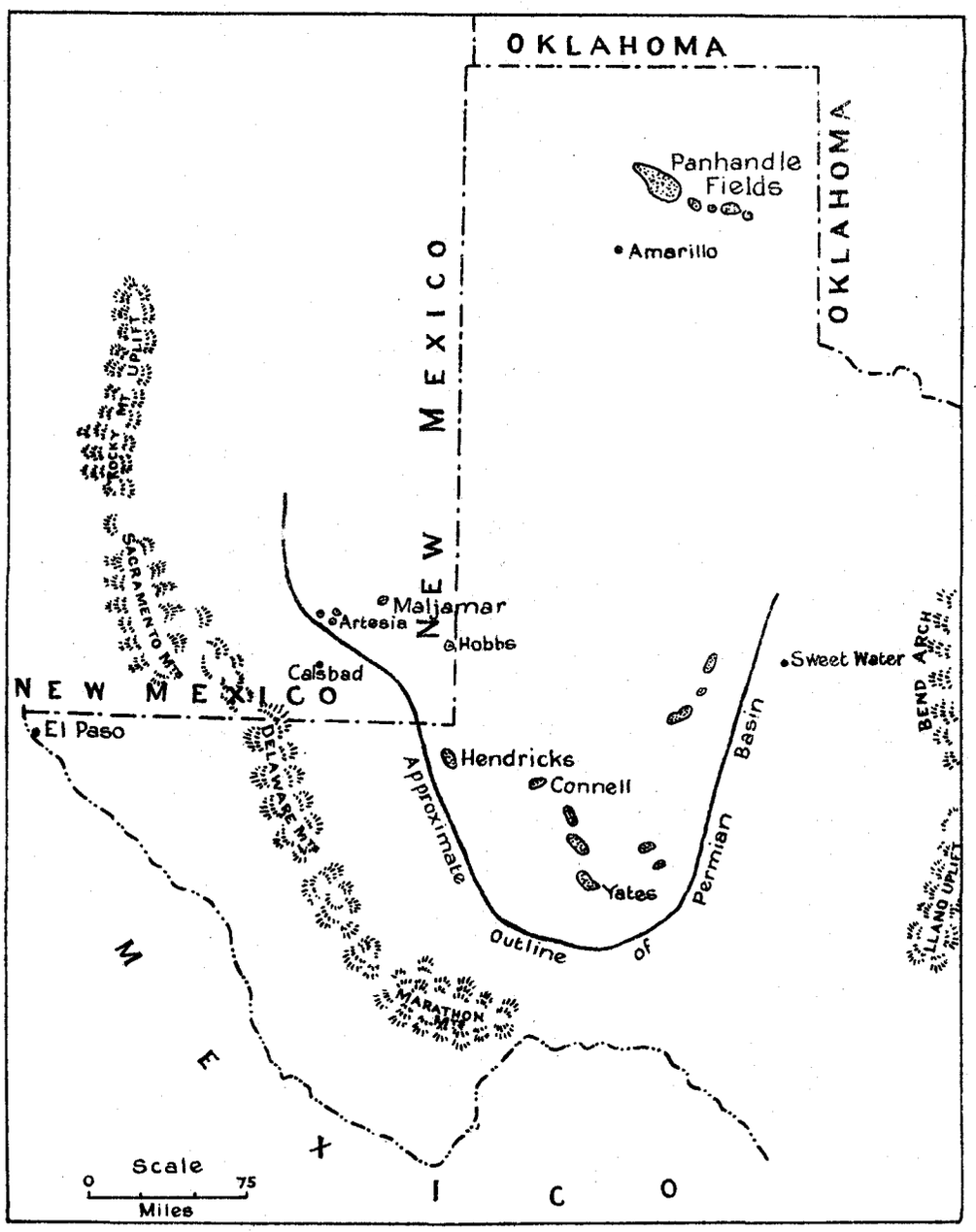


— Sketch Map —

— WEST TEXAS PERMIAN BASIN —

— Shewing relation to uplifts and arrangement —

— of oil-fields parallel to rim of Basin —



Basin yet to be examined, and most of this country, from a detailed structural point of view at least, is almost entirely unknown. This area should certainly be examined with the object of locating structures lying parallel to the periphery of the Basin and some distance from its edge, similar to the line of folding already mapped in the Fitzroy River-Christmas Creek Area.

Another line of investigation which might produce results would be the projection into the Basin of any main trend lines existing in the older rocks outside the Basin; the object being to locate structures owing their origin to Carboniferous or Post Carboniferous movements along such pre-existing lines of weakness.

It should be borne in mind that closed anticlinal folds are not the only suitable reservoirs for petroleum. Monoclines and terraces, due to flattening of regional dip, offer distinct possibilities where there are indications that closure has been completed, whether by faulting movements, by the uneven porosity of reservoir rocks, or by the lensing of the formations.

That the proving of an oil field is not a matter of a few months, and that it may possibly call for years of search, is shown by the early history of the West Texas Permian Basin, to-day one of the leading producing districts of the American Mid-Continent region.

Until 1920 this district was not regarded with much favour as a potential oil district. Some hundreds of wells had been drilled with little more than a few small showings of oil and gas as a result. In 1920 a "Wildcat" well, which had been located purely by chance well away from the intended location, was brought into production with a flow of 10 barrels of oil per day. This production, insignificant in any but a new field, stimulated interest in the district and development was rapid, so that by the end of 1928 the daily output of the fields in the West Texas Basin was over 350,000 barrels. This figure was much less than the potential flow of the wells, as production was limited by pipe-line capacity and the closing in of wells to prevent flooding of markets.

PETROLOGY.

ANNUAL REPORT FOR 1929.

C. O. G. Larcombe, D.Sc., Acting Petrologist.

I am pleased to submit the following report on work carried out in this Department during the year 1929.

The Government carried on a consistent scheme of boring all through the year, and as a result much of the petrological work was devoted to an examination of the cores from the various bores. The Geological survey of the Kalgoorlie Goldfield was continued during 1929 by Mr. Feldtmann and I was closely associated with him in petrologically examining the rocks of that area. Petrographic investigations were also made for Government Departments and for the general public. Details are as follows:—

1. Petrological examination of cores from the Big Bell Mine, Cue.
2. Petrological examination of cores from the Little Bell Mine, Cue.
3. Petrological examination of cores from bores at Norseman.
4. Petrological examination of cores from the Carbine Mine.
5. Petrological examination of cores from the Prophecy Mine, Bamboo Creek.
6. Petrological examination of core from the Kitchener Mine, Bamboo Creek.
7. Petrological examination of core from various bores at Braeside.
8. Petrological examination of cores from the Enterprise Mine, Kalgoorlie.
9. Petrological determinations in connection with the geological survey of the Kalgoorlie Goldfield.
10. Petrological examination of some ore from Wiluna.

1.—BORING AT BIG BELL GOLD MINE, CUE.

Boring was continued at this mine throughout the year. The reports on Nos. 1, 2, and 2 (New) were published in the Annual Report for 1928. This year core was petrologically examined from five extra bores, viz., Nos. 3, 4, 5, 6 and 7.

The petrological investigations, combined with a study of the values shown in the Government Analyst's assay certificate, show that:—

1. The lodestuff in all the bores is the same—physically, mineralogically, and lithologically, viz., a powerfully schisted and granulated pyritic muscovite quartz schist with distinctive white pearly lustred faces, parallel to the planes of schistosity. This schist is riddled with veins and veinlets of glassy quartz, alaskite and pegmatite.
2. The lodestuff persists to over 500 feet in vertical depth. At this depth the channel is just as strong as anywhere else.
3. The values continue to this depth (500 feet vertical).
4. The dip of the hanging wall of the lode channel—as indicated by a petrological examination of the cores from the Nos. 1, 5 and 6 bores—is more likely to be in the vicinity of 63 degrees than vertical.
5. The immediate footwall is generally a more massive white muscovite quartzitic rock, and
6. In the footwall the bores ultimately pass into dense dark green to black siliceous. garnetiferous biotite-actinolite schist with considerable zoisite in places.

The following are the details of the boring:—

No. 3 Bore, Big Bell Mine.

1. This is the most southerly bore put down. Its angle of inclination was 45 degrees, and its depth along the incline was 255 feet.

2. The core from this bore showed some interesting features, viz.:—

(a) It was distinctly auriferous from the start—44 feet to 219 feet, *i.e.*, 175 feet along the angle of inclination to the bore,

(b) The usual distinctive and characteristic lode-stuff, viz.: granulated pyritic white quartz muscovite schist extended from about 111 feet to 219 feet.

(c) Nevertheless, the ferruginous biotite and, in places white schist, in (a) from 44 to 111 feet, *i.e.*, 67 feet contained values as good as most of the distinctive lodestuff, thus making a total of 175 feet of continuous values from 44 feet to 219 feet.

(d) The assay results of (a), (b) and (c), together with cuttings from 90 to 111 feet; 111 to 199 feet 6 inches; and 199 feet 6 inches to 216 feet, are shown in the attached table. (Table I.)

3. This bore stopped in the white quartzitic muscovite-bearing rock. It did not extend to the dark actinolite-zoisite rocks that are to be expected in the footwall.

TABLE 1.

BIG BELL MINE—CUE.

Assay Values—No. 3 Bore.

Depth in feet.	Core received.	Nature of Rock.	Gold per ton.
ft. in. ft. in.	ft. in.		oz. dwt. grs.
44 0 to 46 6	1 0	Coarse decomposed biotite schist	0 4 22
46 6 „ 50 0	1 0	Decomposed white schist	0 1 2
50 0 „ 56 0	2 5	Rotten granite	0 2 2
56 0 „ 57 0	0 3	White schist with ¼-inch quartz vein	0 5 9
57 0 „ 61 0	1 0	White schist	0 7 15
61 0 „ 80 2	2 6	Ferruginous schist—may be intercalated basic schist	0 0 21
80 2 „ 81 0	0 9	Ferruginous white schist	0 5 21
81 0 „ 85 0	1 0	Ferruginous white schist with quartz vein	0 5 9
85 0 „ 90 0	1 6	Ferruginous white schist	0 0 14
90 0 „ 93 0	1 0	White schist—slightly ferruginous	Trace
93 0 „ 96 0	1 0	Ferruginous schist	0 0 21
96 0 „ 99 0	2 0	Ferruginous schist	0 0 10
99 0 „ 111 0	2 0	Slightly ferruginous white schist	0 0 14
111 0 „ 117 0	2 0	Pyritic granular white schist (typical lode)	0 0 21
117 0 „ 122 0	1 6	Pyritic white schist with pegmatite and quartz	0 0 14
122 0 „ 128 0	2 6	Pyritic white schist with pegmatite and quartz	0 4 12
128 0 „ 134 0	3 6	Granulated pyritic schist	0 0 17
134 0 „ 139 8	3 0	Granulated pyritic schist } Good-looking lode stuff	1 1 19
139 8 „ 148 0	2 0	Granulated pyritic schist } Good-looking lode stuff	0 15 11
148 0 „ 152 0	1 0	Granulated pyritic schist } Good-looking lode stuff	0 9 3
152 0 „ 156 0	2 0	Slightly pyritic white schist	0 0 21
156 0 „ 161 0	3 0	Pyritic schist with pegmatite	0 3 11
161 0 „ 168 0	3 0	Pyritic granular schist with pegmatite	0 0 10
168 0 „ 176 0	2 0	Pyritic granular schist with pegmatite	0 1 18
176 0 „ 186 0	2 0	Pyritic granular schist with pegmatite	0 1 21
186 0 „ 192 0	5 0	Pyritic granular schist with pegmatite	0 2 21
192 0 „ 200 0	4 0	Pyritic granular schist with pegmatite	0 1 7
200 0 „ 206 0	3 0	Slightly pyritic ironstained white schist	0 1 15
206 0 „ 213 0	3 6	Slightly pyritic ironstained white schist	0 1 7
213 0 „ 219 0	4 6	Slightly pyritic ironstained white schist	0 1 7

			Gold per ton.	Silver per ton.
			oz. dwt. gr.	ozs. dwt. grs.
219 0 „ 221 6	2 0	Slightly pyritic white schist	0 0 14	0 3 16
221 6 „ 226 6	3 6	More massive quartzite with some schist	0 0 17	0 4 6
226 6 „ 230 3	3 0	Dense white rock with a little pegmatite	0 0 5	0 1 2
230 3 „ 232 6	2 0	White rock with a little schist	*Nil*	0 0 10
232 6 „ 237 9	4 0	A band of typical white granulated quartz schist	*Nil*	0 0 21
237 9 „ 243 0	3 0	Dark schist with a quartz vein	Trace	0 2 14
243 0 „ 249 0	4 6	Massive white graywacke	*Nil*	0 0 14
249 0 „ 255 0	5 0	Massive white graywacke, but on dark side and somewhat schisted	*Nil*	0 3 6

No. 4 Bore, Big Bell Mine.

1. The *main lode* seems to have extended from 111 feet to 176 feet, *i.e.*, 65 feet along the angle of inclination of the bore, viz., 45 degrees.

2. *Assays.*—The following are the results:—

Depth in feet.						Core received.	Gold per ton.		
ft.	in.		ft.	in.			inches.	oz.	dwt.	grs.
87	0	to	89	0	... ...		...	0	0	10
89	0	,,	91	0	... ...		...	0	0	5
91	0	,,	93	0	... ...		...		*nil*	
93	0	,,	97	0	... ...		...		trace	
97	0	,,	99	0	... ...		...	0	0	5
99	0	,,	101	0	... ...		...	0	0	8
101	0	,,	103	10	... ...		...	0	2	18
103	10	,,	111	0	... ...		...		trace	
111	0	,,	114	6	... ...		3	0	0	21
114	6	,,	116	6	... ...		4	0	0	5
116	6	,,	118	6	... ...		5	0	1	5
118	6	,,	120	7	... ...		1¾	0	4	3
120	7	,,	122	8	... ...		7	0	7	20
122	8	,,	124	9	... ...		8	0	17	0
124	9	,,	126	10	... ...		9	0	3	9
126	10	,,	128	11	... ...		15	0	0	5
128	11	,,	131	0	... ...		1½	0	1	18
131	0	,,	132	4	... ...		10	0	0	17
132	4	,,	135	0	... ...		3	0	0	10
135	0	,,	137	2	... ...		2	0	0	5
137	2	,,	140	5	... ...		3	0	2	4
140	5	,,	143	7	... ...		10	0	0	21
143	7	,,	146	2	... ...		2½	0	0	5
146	2	,,	149	0	... ...		10½	0	17	15
149	0	,,	152	0	... ...		27	0	19	4
152	0	,,	154	0	... ...		8	0	0	8
154	0	,,	156	0	... ...		8	0	3	9
156	0	,,	158	0	... ...		10½	0	0	8
158	0	,,	160	0	... ...		4½	0	0	8
160	0	,,	162	6	... ...		13	0	2	14
162	6	,,	165	0	... ...		9	0	3	1
165	0	,,	167	0	... ...		3½	0	11	11
167	0	,,	168	0	... ...		6	0	3	6
168	0	,,	168	6	... ...		5	0	0	10
168	6	,,	171	6	... ...		15	0	0	10
171	6	,,	172	10	... ...		6½		*nil*	
172	10	,,	173	10	... ...		9		trace	
173	10	,,	175	4	... ...		9	0	0	5
175	4	,,	176	0	... ...		8	0	1	2

In addition to the above, the whole of the core from 176 to 218 feet was assayed. Nineteen assays were made and not one of them showed any gold at all. This is evidently footwall country.

3. This bore is the furthest north of the seven bores put down. It is 200 feet northerly from the No. 1 Bore and 60 feet northerly from the open cut. The results above show that values and lode formation persist as far north as this bore.

No. 5 Bore, Big Bell Mine.

1. This bore was commenced at a point 37 feet south of No. 1 Bore, but 237 feet on the hanging wall of the lode. The angle of depression was 60 degrees. The bottom of the hole along the angle of inclination was 690 feet.

2. *Rock Formations*—

Depth in feet.				Nature of Rock.
ft.	in.	ft.	in.	
59	6 to	260	00	White schisted sandstone with bands of biotite schist—hangingwall country.
260	0 ,,	263	4	*Lodestuff.*—Granulated to saccharoidal quartz-muscovite schist impregnated with grains of iron pyrites and traversed by glassy quartz veinlets parallel to the planes of schistosity.
363	4 ,,	367	0	Coarse quartz-mica-felspar pegmatite.
367	0 ,,	412	0	Dense white to gray and somewhat schisted quartzite with some muscovite.
412	0 ,,	690	0	Dark-green to black siliceous and garnetiferous biotite-actinolite schist grading gradually at about 590 feet into a very dense dark green siliceous actinolite-zoisite rock—microscopically schistose.

3. *Assays.*—The main and only lode in this bore lies between 260 and 363 feet 4 inches.

The returns are as follow:—

Depth in feet.						Gold per Ton.		
ft.	in.		ft.	in.		oz.	dwt.	grs.
260	0	to	264	0	... ...	0	1	5
264	0	,,	268	0	... ...	0	1	12
268	0	,,	272	0	... ...	0	0	14
272	0	,,	275	10	... ...	0	0	21
275	10	,,	280	0	... ...	0	0	21
280	0	,,	284	0	... ...	0	1	12
284	0	,,	288	0	... ...	1	1	7
288	0	,,	292	8	... ...	0	0	5
292	8	,,	295	8	... ...	0	9	3
295	8	,,	297	8	... ...	0	2	3
297	8	,,	300	0	... ...	0	1	0
300	0	,,	304	0	... ...	0	4	12
304	0	,,	307	10	... ...	0	6	23
307	10	,,	312	0	... ...	0	1	0
312	0	,,	316	0	... ...	0	1	0
316	0	,,	320	0	... ...	0	1	10
320	0	,,	324	0	... ...	0	2	21
324	0	,,	328	0	... ...	0	5	6
328	0	,,	332	0	... ...	0	3	11
332	0	,,	336	0	... ...	0	2	14
336	0	,,	340	0	... ...	0	4	22
340	0	,,	343	4	... ...	0	7	3
343	4	,,	348	0	... ...	0	0	21
348	0	,,	351	0	... ...	0	1	10
351	0	,,	352	0	... ...	0	6	23
352	0	,,	356	0	... ...	0	2	2
356	0	,,	360	0	... ...	0	0	3
360	0	,,	363	4	... ...	0	1	5

For some reason, quite a lot of this core was assayed with negative results, as follow:—

Between 393ft. 5in. and 487ft. seven assays of core from the following depths were made: 393ft. 5in. to 394ft. 5in., 411ft. 4in. to 412ft. 9in., 412ft. 9in. to 413ft. 6in., 416ft. 3in. to 417ft. 6in., 421ft. 8in. to 423ft. 10in., 463ft. to 465ft. and 486ft. to 487ft.

No gold was found in these samples.

Between 506ft. and 557ft. was all assayed.

Twenty-six assays were made and no gold was detected anywhere.

Between 590ft. 8in. and 656ft. 5in. was all assayed in 2ft. sections but no gold was detected.

4. *The Lodestuff.*—Of the first five bores this is the deepest level, viz., 260 to 363 feet 4 inches, at which the lode has been cut. It is identical with the lodestuff in the Nos. 1, 2, 2 (new), 3, and 4 bores. The lodestuff is noted for its granularity, schistosity, abundance of muscovite scales, impregnation with granular iron pyrites, and presence of glassy quartz alaskite, and pegmatitic veinlets and veins. The specimen from 317 feet shows the characteristic and astonishing parallelism of the muscovite rods.

5. *General Remarks.*—This bore is of interest because, so far, it is the deepest that has been put down. Petrographical investigations combined with assay results show that—

(a) the lode is lithologically and mineralogically identical with that found in the Nos. 1, 2, 2 (new), 3 and 4 bores.

(b) The lode is maintaining the same specific characters and similar values at this depth.

(c) The footwall of the lode is a non-pyritic grayish-white, dense, and somewhat schisted quartzite, with a width of about 49 feet from 363 to 412 feet.

(d) Beyond this dense grayish white band of quartzite the country rock is made of dark green to black siliceous and garnetiferous biotite-actinolite schist, which passes into exceedingly dense siliceous dark-green actinolite-zoisite rock.

(e) The actinolite-zoisite rocks of the footwall country are devoid of gold. They are probably the equivalents of the fine-grained granulitic zoisite-quartz epidiorite described by Mr. Farquharson from an outcrop on the eastern side of the lode.

(f) The Nos. 1 and 2 (new) bores revealed the presence of dense actinolite-zoisite rocks in the footwall. This band of rock seems therefore to be continuous from the surface to the deepest point yet reached in the bores.

No. 6 Bore, Big Bell Mine.

1. This bore was commenced immediately behind No. 5 bore at a point 470 feet at right angles from the hanging wall of the lode.

2. The angle of depression was 60 degrees.

3. The total depth along the angle of inclination was 616 feet 9 inches.

4. *Rock Formations.*—This bore started in moderately fresh rock. The formations met with are as follow:—

Depth in feet.				Nature of Rock.
ft.	in.	ft.	in.	
0	0 to	495	0	White to grey saccharoidal micaceous (black and white) banded sandstone schist, darkened in numerous places by much biotite. It consists of innumerable quartz grains with some felspar, occasional ragged piece of chlorite, frequently much biotite and a few garnets. At 467 feet is a small band of beautiful zoisite-biotite schist traversed by a glassy quartz vein.
495	0 ,,	604	0	*Lode Channel.*—A powerfully schisted and granulated muscovite sandstone zone impregnated with iron pyrites and traversed by glassy quartz alaskite, and pegmatitic veins and veinlets. The *Main Lode* extends from 495 to 586 feet.
604	0 ,,	616	9	Faintly banded dense white to grey and somewhat schisted quartzite (arkosic) with a little muscovite.

5. *Assays.*—Judging from results the main auriferous channel extends from 495 to 603.6 feet, *i.e.*, 108 feet 6 inches. The results are as follow:—

Depth in feet.				Gold per ton.
ft.	in.	ft.	in.	ozs. dwt. grs.
495	0 to	497	0	0 4 14
497	0 ,,	498	7½	0 1 18
498	7½ ,,	500	3	0 11 23
500	3 ,,	502	0	1 1 5
502	0 ,,	504	0	0 0 3
504	0 ,,	506	0	0 0 3
506	0 ,,	508	0	0 1 18
508	0 ,,	510	0	0 16 3
510	0 ,,	512	0	0 1 21
512	0 ,,	514	0	0 0 5
514	0 ,,	516	0	0 4 19
516	0 ,,	518	0	0 1 15
518	0 ,,	520	0	Trace (under 3 grs)
520	0 ,,	522	0	0 0 10
522	0 ,,	524	0	Trace
524	0 ,,	526	0	0 0 3
526	0 ,,	528	0	0 1 10
528	0 ,,	530	0	0 2 14
530	0 ,,	532	0	0 0 17
532	0 ,,	534	0	0 2 17
534	0 ,,	536	0	0 7 18
536	0 ,,	538	2	0 10 19
538	2 ,,	540	4	0 8 15
540	4 ,,	542	4	Trace (under 3 grs.)
542	4 ,,	544	4	0 0 21
544	4 ,,	546	4	0 1 5
546	4 ,,	548	0	0 3 22
548	0 ,,	549	10	0 3 11
549	10 ,,	551	9	0 1 7
551	9 ,,	552	6	0 6 8
552	6 ,,	554	0	0 0 5
554	0 ,,	556	0	0 2 17
556	0 ,,	558	0	0 8 20
558	0 ,,	560	4	0 12 0
560	4 ,,	562	9	0 18 0
562	9 ,,	565	3	0 4 9
565	3 ,,	567	2	0 4 6
567	2 ,,	569	4	0 13 16
569	4 ,,	571	6	0 2 14
571	6 ,,	573	9	0 5 6
573	9 ,,	576	0	0 0 5
576	0 ,,	578	3	0 1 21
578	3 ,,	580	6	0 1 21
580	6 ,,	582	6	0 0 10
582	6 ,,	584	0	0 1 15
584	0 ,,	586	0	0 2 9
586	0 ,,	588	0	*Nil*
588	0 ,,	590	10	0 0 5
590	10 ,,	593	8	Trace
593	8 ,,	595	0	0 0 5
595	0 ,,	597	0	0 0 3
597	0 ,,	599	0	0 0 21
599	0 ,,	601	0	Trace
601	0 ,,	603	6	0 0 3

From the above results it will be seen that the last 15 feet 6 inches on the footwall side of the channel is very poor. The Main Lode Channel extends from 495 to 586 feet, *i.e.* 91 feet; nevertheless, petrological examination shows that the true lodestuff extends to 604 feet, and this poorness on the footwall side may be only local.

Forty-nine feet of hangingwall rock was assayed from 446 to 495 feet. With the exception of 2 dwt. 9 gr. between 456 and 458 feet, and 10 gr. between 477 and 479 feet, the whole of this rock contained less than ¼ dwt. (6 gr.) of gold per ton.

6. *The Lodestuff.*—This was the same as in all the other bores, viz., granulated and powerfully schisted pyritic micaceous sandstone traversed by glassy quartz, alaskite and pegmatitic veins and veinlets. The lode extended 109 feet from 495 to 604 feet along the inclination of the bore. At 509 feet it contained a considerable amount of microcline. At 502 feet was a quartz-muscovite-microcline vein heavily charged with iron pyrites.

7. *General Remarks.*—The petrological examination shows that the lode formation at these depths (495-604 feet) is still well-defined and powerfully schisted. The bore finished in the dense white quartzitic rock and did not reach the dark actinolite-zoisite rock.

No. 7 Bore, Big Bell Mine.

1. This was the last bore put down by the Government. Its angle of inclination was 60 degrees, and its depth along this angle was 642 feet, or a vertical depth of 556 feet.

2. *Lode Material and Values.*—Judging from assay results the lode extended from 462 to 618 feet, *i.e.*, 156 feet along the angle of inclination of the bore.

The values are as follow:—

Depth in feet.						Core received.	Gold per ton.		
ft.	in.		ft.	in.		inches.	oz.	dwt.	grs.
462	0	to	464	0	... ...	...	trace		
464	0	„	466	0	... ...	...	0	0	5
466	0	„	468	0	... ...	...	0	10	16
468	0	„	470	0	... ...	...	0	0	3
470	0	„	472	0	... ...	...	0	1	18
472	0	„	474	0	... ...	...	0	0	3
474	0	„	476	0	... ...	...	0	0	13
476	0	„	478	0	... ...	...	0	0	10
478	0	„	480	0	... ...	...	0	0	5
480	0	„	482	0	... ...	...	*Nil*		
482	0	„	484	0	... ...	...	0	0	3
484	0	„	486	0	... ...	...	0	0	10
486	0	„	488	0	... ...	...	0	0	21
488	0	„	492	0	... ...	...	*Nil*		
492	0	„	494	0	... ...	...	0	0	10
494	0	„	496	0	... ...	...	0	0	5
496	0	„	498	0	... ...	...	0	5	9
498	0	„	500	0	... ...	...	0	0	10
500	0	„	504	0	... ...	...	0	0	14
504	0	„	506	0	... ...	...	0	3	22
506	0	„	508	0	... ...	...	0	4	1
508	0	„	510	0	... ...	...	0	9	14
510	0	„	512	0	... ...	...	0	1	12
512	0	„	514	0	... ...	...	0	3	1
514	0	„	516	0	... ...	...	0	8	1
516	0	„	517	0	... ...	...	0	2	12
517	0	„	520	8	... ...	18	0	9	14
520	8	„	523	3	... ...	12	0	1	5
523	3	„	525	9	... ...	10	0	10	11
525	9	„	528	0	... ...	...	0	7	6
528	0	„	529	4	... ...	9	0	0	3
529	4	„	532	3	... ...	6	0	0	13
532	3	„	533	11	... ...	7	*Nil*		
533	11	„	537	0	... ...	18	0	0	5
537	0	„	538	0	... ...	...	0	0	10
538	0	„	540	0	... ...	...	0	2	2
540	0	„	542	0	... ...	...	0	2	2
542	0	„	544	0	... ...	...	0	5	9
544	0	„	546	0	... ...	...	0	5	6
546	0	„	548	0	... ...	...	0	2	14
548	0	„	550	0	... ...	...	0	1	5
550	0	„	552	0	... ...	...	0	1	2
552	0	„	554	0	... ...	...	0	0	21
554	0	„	556	0	... ...	...	0	0	5
556	0	„	558	0	... ...	...	0	6	0
558	0	„	560	0	... ...	...	0	0	21
560	0	„	562	0	... ...	...	0	0	21
562	0	„	564	0	... ...	...	0	1	23
564	0	„	566	0	... ...	...	0	0	17
566	0	„	568	0	... ...	...	0	7	10
568	0	„	570	0	... ...	...	0	0	13
570	0	„	572	0	... ...	...	0	3	5
572	0	„	574	0	... ...	...	0	3	6
574	0	„	576	0	... ...	...	0	17	15
576	0	„	578	0	... ...	7½	0	5	9
578	0	„	580	0	... ...	...	0	2	14
580	0	„	582	0	... ...	...	0	1	15
582	0	„	584	0	... ...	...	0	2	12
584	0	„	586	0	... ...	...	0	6	13
586	0	„	588	0	... ...	...	0	1	7
588	0	„	590	0	... ...	...	0	2	14
590	0	„	592	0	... ...	...	0	3	6
592	0	„	594	0	... ...	...	0	10	16
594	0	„	596	0	... ...	...	0	5	21
596	0	„	598	0	... ...	...	0	1	21
598	0	„	600	0	... ...	...	*Nil*		
600	0	„	602	0	... ...	...	trace		
602	0	„	604	0	... ...	...	0	1	5
604	0	„	605	9	... ...	...	trace		
605	9	„	609	6	... ...	9	trace		
609	6	„	612	0	... ...	...	trace		
612	0	„	614	0	... ...	...	0	2	21
614	0	„	616	0	... ...	...	0	2	9
616	0	„	618	0	... ...	...	0	1	15
618	0	„	620	0	... ...	...	*Nil*		
620	0	„	622	4	... ...	...	trace		
622	4	„	623	3	... ...	4½	*Nil*		
623	3	„	625	9	... ...	...	*Nil*		
625	9	„	628	3	... ...	...	*Nil*		
628	3	„	630	9	... ...	...	*Nil*		

Of the remainder of the core assayed, from 618 to 630 feet 9 inches, five assays yielded no gold at all, and one gave a trace.

In addition to the above, average assays were made of 359 feet 7 inches of country on the hangingwall side of the lode between depths of 101 feet 5 inches and 461 feet. Eighty-eight assays were made, but no gold whatever was disclosed.

3. *Rock Formations.*—The only rock formation seen was that between 25 and 461 feet. This was all the usual typical hangingwall country. It consisted of somewhat banded white to dark micaceous (white) sandstone schist with bands of biotite sandstone schist containing garnets in places. Occasional glassy quartz and pegmatite veins were noted. The last 4 feet, from 457 to 461 feet, was a coarse-grained biotite quartz schist.

4. This bore is of interest (a) because it has proved the existence of the lode to a vertical depth of over 500 feet (535 feet, provided there is no deflection in the bore), and (b) because the values apparently continue in depth. These facts are in accord with the petrological evidence regarding this unusual type of ore deposit.

2.—BORING AT LITTLE BELL GOLD MINE, CUE.

Final Report on 3 *Bores.*

1. Three bores, Nos. 1, 2 and 3, were put down on the Little Bell Gold Mine, Lease 2050, immediately adjoining the Big Bell Lease on the southeast.

2. The bores are as follow:—

No.	Angle of Depression deg.	Inclined depth. ft.	in.	Vertical depth. feet.
1	60	331	0	286·6
2	60	316	0	273·6
3	60	407	8	352·4

3. The attached plan shows the relative positions of these bores.

No. 1 *Bore.*

1. Rock Formations.—The rock matter passed through is as follows:—

Depth in feet.		Nature of Rock.
140ft. to 196ft.	...	White clayey schist.
196ft. to 273ft.	...	Dark schist, in places ferruginous and containing a considerable amount of coarse biotite schist with garnets in places. This rock is lithologically similar to part of the formation met with in the Big Bell bore.
273ft. to 289ft.	...	Coarse-grained biotite quartz schist. with a glassy pyritic quartz vein at 275 feet.
289ft. to 331ft.	...	Muscovite quartz schist with some glassy quartz veins and pyrites. The last six feet from 325ft.-331ft. is more dense and quartzitic.

2. Assays.—Quite a lot of this core was assayed. The following is a summary of the results:—

Depth in feet.						Core received.	Gold per ton.		
ft.	in.		ft.	in.		ft. in.	oz.	dwt.	grs.
140	0	to	201	3	... ...	all assayed	*Nil*		
201	3	„	209	3	... ...	2 0	0	3	6
209	3	„	213	3	... ...	0 10	0	3	1
213	3	„	218	3	... ...	2 4	*Nil*		
218	3	„	223	3	... ...	1 2	0	3	11
223	3	„	255	6	... ...	averaged	*Nil*		
255	6	„	257	10	... ...	1 7	0	0	8
257	10	„	261	0	... ...	1 2	0	0	3
261	0	„	329	2	... ...	averaged	*Nil* and traces		
329	2	„	331	0	... ...	1 6	0	0	21

The above assays show that, with the exception of 12 feet from 201 feet 3 inches to 213 feet 3 inches,

and 5 feet from 218 feet 3 inches to 223 feet 3 inches, the rest of the core contained practically nothing.

3. Petrological examination shows that the best values—the best being less than 4 dwts.—were found in the dark biotite schist rock. The formation between 289 and 331 feet, lithologically similar to the auriferous rock in the Big Bell Mine, is unpayable in this bore.

No. 2 Bore.

1. This bore was started about 370 feet north-westerly from No. 1 Bore.

2. Rock Formations.—The rock matter passed through is as follows:—

Depth in feet.		Nature of Rock.
192ft. to 248ft.	...	A mixture of biotite and muscovite quartz schist with glassy quartz veins, pegmatitic veins and a little tourmaline-bearing granite veins. A fair amount of biotite schist is intercalated with the white muscovite quartz schist.
248ft. to 275ft.	...	Coarse-grained biotite schist.
275ft. to 316ft.	...	Muscovite quartz-schist with a fair amount of iron pyrites in places and glassy quartz veins. The bore ended in muscovite quartz schist.

3. Assays.—The whole of the core between 190 and 316 feet was averaged and assayed. The following is the summary of the results:—

Depth in feet.						Core received.		Gold per ton.		
ft.	in.		ft.	in.		ft.	in.	oz.	dwt.	grs.
190	0	to	194	0	... ...	1	3	0	3	1
194	0	„	205	8	... ...	...		*Nil* and traces		
205	8	„	207	7	... ...	0	9	0	0	14
207	7	„	209	6	... ...	0	9	0	5	19
209	6	„	212	7	... ...	0	9	0	0	21
212	7	„	215	2	... ...	0	9	0	0	17
215	2	„	218	0	... ...	0	9	0	2	21
218	0	„	220	4	... ...	1	2	0	2	4
220	4	„	224	0	... ...	0	8	0	2	4
224	0	„	226	5	... ...	0	8	0	2	14
226	5	„	228	10	... ...	1	5	0	13	12
228	10	„	130	9	... ...	0	10	0	0	10
230	9	„	233	2	... ...	0	2	0	0	10
233	2	„	236	0	... ...	2	4	*Nil* and trace		
236	0	„	238	0	... ...	1	5	0	0	5
238	0	„	244	0	... ...	...		*Nil*		
244	0	„	246	0	... ...	1	1	0	2	0
246	0	„	250	8	... ...	...		*Nil*		
250	8	„	252	8	... ...	1	9	0	0	3
252	8	„	254	9	... ...	2	0	0	2	17
254	9	„	256	10	... ...	2	0	0	1	18
256	10	„	258	10	... ...	2	0	0	2	9
258	10	„	261	0	... ...	2	0	0	0	10
261	0	„	263	0	... ...	2	0	0	0	5
263	0	„	272	9	... ...	...		*Nil*		
272	9	„	276	8	... ...	...		trace		
276	8	„	278	8	... ...	1	3	0	0	14
278	8	„	280	6	... ...	1	3	*Nil*		
280	6	„	281	10	... ...	0	5	0	0	5
281	10	„	283	5	... ...	1	1	0	1	10
283	5	„	285	1	... ...	1	1	0	0	5
285	1	„	287	0	... ...	1	8	0	0	10
287	0	„	289	0	... ...	1	7	0	0	3
289	0	„	291	2	... ...	1	5	0	0	3
291	2	„	293	5	... ...	0	2	0	0	5
293	5	„	295	7	... ...	1	10	0	0	10
295	7	„	298	0	... ...	1	11	0	2	2
298	0	„	300	0	... ...	2	0	0	0	3
300	0	„	302	0	... ...	1	7	trace		
302	0	„	316	0	... ...	...		*Nil*		

4. The assay results show that gold is more or less distributed over 110 feet along the inclination of the bore, from 190 to 300 feet; in other words, this bore has disclosed a very low-grade formation. The best run of ore is from 207 feet 7 inches to 228 feet 10 inches, *i.e.*, 21 feet 3 inches, ranging from 21 gr. to 13 dwt. 12 gr. per ton.

5. The schist in this bore is distinctly more granulated—like Big Bell ore—than the rock from No. 1 Bore. The ore, that assayed 13 dwt. 12 gr. (226 feet 5 inches to 228 feet 10 inches), was distinctly granulated and pyritic.

6. The values between 244 feet and 263 feet came from coarse-grained biotite quartz schist. This is important because it shows that the gold is not always confined to the white granulated muscovite quartz schist. It has already been noted that the gold in the Big Bell Mine was occasionally found in the biotite schist which occurred mainly in the hanging wall of the Big Bell lode and occasionally in layers intercalated with the white granulated pyritic lode stuff.

7. The white muscovite quartz schist from 275 feet to 315 feet 3 inches contained a fair amount of iron pyrites in places, also glassy quartz veins. This pyritic schist is lithologically the same as the Big Bell lodestuff, but in this bore the assay values were very low.

No. 3 Bore.

1. This bore is the nearest to the Big Bell boundary, and is situated about 135 feet north-westerly from No. 2 Bore.

2. Rock Formations.—The rock matter passed through is as follows:—

Depth in feet.		Nature of Rock.
184ft. to 313ft.	...	Banded white muscovite-biotite sandstone schist with an occasional glassy quartz vein.
313ft. to 352ft.	...	Coarse-grained biotite-quartz schist.
352ft. to 398ft.	...	Muscovite sandstone schist, somewhat granulated and pyritic. From 368ft. to 392ft. is strongly pyritic and granulated; these 24ft. are typical of Big Bell ore.
398ft. to 407ft.	8in.	Dense white muscovite-bearing quartzite.

3. Assays.—One hundred and nine (109) assays were made of core from this bore. The results may be summarised as follow:—

Depth in feet.						Core received.	Gold per ton.		
ft.	in.		ft.	in.		inches.	oz.	dwt.	grs.
184	0	to	313	0	... ...	...	trace		
313	0	„	315	0	... ...	21	*Nil*		
315	0	„	319	0	... ...	45	trace		
319	0	„	322	5	... ...	24	trace		
322	5	„	325	4	... ...	30	0	0	10
325	4	„	336	7	... ...	...	*Nil*		
336	7	„	338	8	... ...	24	0	0	5
338	8	„	360	0	... ...	...	*Nil*		
360	0	„	362	0	... ...	11	0	1	5
362	0	„	364	0	... ...	14	0	0	13
364	0	„	366	0	... ...	24	0	0	10
366	0	„	368	0	... ...	23	0	0	14
368	0	„	382	0	... ...	...	*Nil*		
382	0	„	384	0	... ...	20	0	0	17
384	0	„	386	0	... ...	24	0	2	0
386	0	„	388	0	... ...	24	0	2	14
388	0	„	390	0	... ...	24	0	1	12
390	0	„	392	0	... ...	23	0	0	17
392	0	„	394	0	... ...	20	0	2	21
394	0	„	407	8	... ...	...	*Nil*		

From the above results it may be seen that there were only two auriferous patches: (1) 8 feet, from 360 feet to 368 feet, and (2) 12 feet, from 382 to

394 feet. Both of these are very low grade, the highest assay being 2 dwt. 21 gr. per ton. From 184 to 360 feet (176 feet along the inclination of the bore) the assays revealed practically no gold.

4. Although the Big Bell ore channel is clearly recognisable between 368 and 392 feet, the values are very low.

Summary and Conclusions from Examination of Core from the Three Bores on Little Bell Gold Mine.

1. The country rock of the Little Bell Mine is lithologically the same as that on the Big Bell Mine. Biotite and muscovite schists, with garnets, glassy quartz veins and so on are found in both bores.

2. The bores in the Little Bell Mine did not go far enough to cut the dark green zoisite hornblende rocks that occur in the footwall country of the Big Bell Mine.

3. In the vicinity of the Little Bell Bores, when compared with the Big Bell area, there is a diminution in (a) metamorphic action in the form of schisting, pyritification and granulation of the rock, (b) intrusive action in the form of injections of auriferous pegmatitic, alaskitic, and glassy quartz veins with sulphide of iron, and (c) a consequent all-round lowering of values.

3.—BORING AT NORSEMAN.

No. 1 *Bore, Mararoa Gold Mine.*

1. This bore was put down vertically to test the lode between 600 and 700 feet. The bottom of the bore reached 700 feet.

2. The bore was in a dense, fine-grained amphibolite rock (cut by felsite dykes) to about 590 feet. At 590 feet a strongly schisted channel was entered and continued to 675 feet. This channel contained the main quartz reef from 609 feet 8 inches to 621 feet 9 inches; a small reef from 647 to 650 feet; and a quartz vein from 671 feet to 672 feet 3 inches. From 675 feet to the end of the bore—700 feet—the core was made of chloritised coarse-grained epidiorite.

3. Ore Deposits.—The main ore deposit was a white quartz reef with, in places, patches and grains of iron pyrites. The assay results are as follow:—

ft.	in.		ft.	in.	
609	8	to	610	4	Gold, a trace (under 5 gr. per ton).
610	4	,,	612	2	Gold, a trace (under 5 gr. per ton).
612	2	,,	613	8	Gold, 10 gr. per ton.
613	8	,,	616	2	Gold, 5 dwt. 21 gr. per ton.
616	2	,,	618	9	Gold, 11 dwt. 2 gr. per ton.
618	9	,,	620	0	Gold, 8 dwt. 10 gr. per ton.
620	0	,,	621	9	Gold, 4 dwt. 1 gr. per ton.

Three feet of white quartz reef, from 647 to 650 feet, assayed:—

ft.	in.		ft.	in.	
647	0	to	648	6	Gold, 10 gr. per ton.
648	6	,,	650	0	Gold, 10 gr. per ton.

The quartz vein from 671 feet to 672 feet 3 inches contained no gold.

The felsite dyke from 400 to 417 feet was averaged, but the assay results showed it to be non-auriferous.

4. The following is the succession of rocks cut in this bore:—

ft.	in.		ft.	in.	
0	0	to	116	0	Dense fine-grained greenstone
116	0	,,	180	0	Gray felsite dyke.
180	0	,,	400	0	Dense fine-grained amphibolite.
400	0	,,	417	0	Gray felsite dyke.
417	0	,,	590	0	Dense fine-grained amphibolite.
590	0	,,	609	8	Chloritised hornblende schist.
609	8	,,	621	9	Main quartz reef.
621	9	,,	647	0	Chloritic hornblende schist.
647	0	,,	650	0	White quartz reef.
650	0	,,	671	0	Chloritic hornblende schist.
671	0	,,	672	3	Quartz vein.
672	3	,,	675	0	Chloritic hornblende schist.
675	0	,,	700	0	Coarse-grained greenstone—epidiorite

5. The petrographic investigations indicate the existence of a very powerful schisted channel between 590 and 675 feet.

This channel is intimately related to the ore deposits, for it acted as the main line of weakness along which the openings formed in which the white quartz of the main and subsidiary reefs was deposited.

The "channel" rock is a chlorite-actinolite-hornblende schist. It is made up of layers of chlorite, actinolite, and some hornblende with quartz mozaics. It is evident that this schist channel has formed from the crushing, breaking-down and schisting of the chloritised coarse-grained epidiorite—typically developed at 675 feet. This epidiorite is made up of plates of pale green uralite, some of which is strongly chloritised. Felspar is common, but it is not saussuritised.

No. 2 *Bore, Mararoa Gold Mine.*

1. This bore was put down vertically with a view to cutting the reef at about 200 feet.

2. *Assays.*—With the exception of 1 foot 2 inches of quartz between 62 feet and 63 feet 2 inches, no distinctive quartz veins were cut. This sample assayed 1 dwt. 2 gr. of gold per ton.

This bore disclosed a powerful schist channel from 30 to 141 feet. The schisting was excessive from 126 to 141 feet, and showed signs of quartz. In consequence, assays were made of core from the following depths: 126-129 feet, 132-133 feet 6 inches, 135-138 feet, and 138-141 feet. The results showed no gold at all.

A little schisted rock was cut between 194 feet 6 inches and 196 feet. It yielded no gold on assaying.

3. The rock formations passed through are as follow:—

ft.	in.		ft.	in.	
0	0	to	30	0	(2 feet of core). Rotten brownish greenstone.
30	0	,,	62	0	Actinolite schist.
62	0	,,	63	2	White quartz.
63	2	,,	141	0	Actinolite schist.
141	0	,,	213	0	Excessively fine-grained amphibolite.
213	0	,,	298	0	(end of bore). Coarser-grained epidiorite.

No. 3 *Bore.*

1. This bore was put down to test the reef on the Viking Gold Mine below the No. 7 level.

2. The vertical depth of this bore is 545 feet.

3. The whole of this bore was in basic epidiorite of varying texture. The first 200 feet was in coarse-grained epidiorite; the last 345 feet being mostly fine-grained epidiorite.

4. *Ore Deposits.*—It should first be pointed out that the powerful schist channel met with in the Nos. 1 and 2 bores was not revealed by petrological examination. One may take it, therefore, that the

schist channel which contains the reefs in the Mararoa line of lode is absent in this bore. The only indications of ore are as follow:—

ft.	in.		ft.	in.	
181	7	to	183	7	Quartz.
525	9	„	526	3	White quartz.
529	10	„	531	0	Siliceous lodestuff with some white quartz.

All this core was assayed, but it contained neither gold nor silver.

5. The succession of rock formations is as follows:—

ft.	in		ft.	in.	
28	6	to	181	7	Coarse-grained basic epidiorite. The rock was more or less fresh at the surface.
181	7	„	183	7	White quartz (no gold).
183	7	„	210	0	Coarse-grained basic epidiorite.
210	0	„	290	0	Dolerite amphibolite.
290	0	„	400	0	Coarse-grained epidiorite.
400	0	„	525	9	Fine-grained epidiorite—felspar microlites in a mass of fine-grained hornblende.
525	9	„	526	3	White quartz vein (no gold).
526	3	„	529	10	Fine-grained epidiorite.
529	10	„	531	0	Siliceous lodestuff with some white quartz.
531	0	„	545	0	Fine-grained epidiorite.

4. BORING AT CARBINE MINE.

1. One vertical bore was put down at this mine with a view to cutting the lode at a depth of about 550 feet.

2. This bore was completed at a vertical depth of 663 feet 4 inches.

3. From 433 feet 6 inches to 438 feet, and again from 450 to 453 feet the core consisted of quartzose material mixed with greenstone. It was all assayed but contained no gold or silver. Apart from this quartzose material the remainder of the core contained no metallic mineralisation or other evidence of lode or reef formation.

4. The zone of oxidation extended to 114 feet. The rest of the bore was in one rock formation, viz., a greenstone derived from very basic rocks. This greenstone ranged from a fine-grained chloritic actinolitic rock through almost pure chlorite rocks to chlorite-carbonate schists. A feature was the numerous pseudo-phenocrysts of biotite and hornblende in the chlorite-carbonate rocks.

5. BORING AT PROPHECY MINE, BAMBOO CREEK.

1. This bore was put down in a westerly direction. Its angle of depression was 45 degrees.

2. The total depth reached along the angle of depression was 475 feet.

3. Throughout its whole length this bore was in one class of rock, viz., a serpentinous talcose rock with carbonated modifications, similar to the country at Kitchener mine. Carbonate veins and veinlets are common.

4. Between 354 and 360 feet the greenstone was so riddled with carbonate veinlets that it was thought advisable to test it by assaying. Three samples were assayed, with the following results:—

354 to 356 feet	...	... Gold:	nil.
356 „ 358 „	...	... Gold:	nil.
358 „ 360 „	...	... Gold:	nil.

5. Apart from the powerfully carbonated zone referred to in (4) the bore passed through no lodestuff, veins, or mineralised zones that warranted assaying.

6.—BORING AT KITCHENER MINE, BAMBOO CREEK.

No. 1 *Bore.*

1. I have examined the core received from this bore between 40 feet and 328 feet, and what was left of the core after selection of samples for assay between 328 and 396 feet.

2. The country rock is similar to that reported on from the No. 2 Bore, viz., talcose-serpentine rock and its modifications.

3. The bore reached a depth of 482 feet.

4. Forty-eight assays were made of practically the whole of the core between 328 and 482 feet, but there was no gold in any of them.

No. 2 *Bore.*

1. This bore was put down at an angle of depression of 60 degrees.

2. It reached a total depth of 500 feet.

3. The bore passed through one rock formation, chiefly a dark-green strongly talcose serpentine with scattered grains of carbonates. This rock is not consistent, but is liable to change—mainly carbonation, e.g., at 390 feet it is essentially a talc carbonate rock, talc predominating in a heterogeneous mass of brightly polarising scales. At 210 feet it is an almost pure carbonate rock.

4. None of the rock in this bore showed sufficient mineralisation to be regarded as lodestuff. However, five assays were made of (a) rock riddled with carbonate veinlets, (b) quartz and carbonate veins mixed with country rock, (c) and in one place talcose serpentine with grains of iron pyrites. The results showed no gold at all. The depths from which the samples were taken are as follow: 190ft.-191ft. 6in., 222ft.-224ft., 242ft.-243ft., 318ft.-342ft., and 391ft.-392ft.

7. BORING AT BRAESIDE.

The petrographical examination of cores from Braeside revealed much that was of interest, and cores were received from the following bores:—

No. 1, Ragged Hill, from 365 to 386 feet, and 3 pieces from 385, 430 and 500 feet.
No. 3, Ragged Hill: Three pieces from 402, 433, and 443 feet.
No. 1 Bore, M.L. 291: From 342 to 385 feet.
No. 2 Bore, M.L. 291: From 76 to 110 feet.
Barker's bore: From 280 to 320 feet.
Kennedy Junior Lease.*

No. 1 *Ragged Hill Bore.*

The rock examined came from between 365 and 386 feet, and specimens from 385, 430 and 500 feet respectively. The succession of rocks is as follows:—

ft.		ft.	
365	to	376	Typical greenstone: chloritised and carbonated basalt.
376	„	382	Brecciated zone with some amygdaloidal greenstone.
382	„	386	Amygdaloidal greenstone after basalt.

* For locality plan of these bores see G.S.W.A., A.R. 1928.

At 365 feet the typical rock is a greenstone representing a chloritised and carbonated basalt. It consists of felspar microlites and small altered laths lying in all azimuths and separated by a heterogeneous mass of shapeless carbonates and chlorite. Veins of carbonates traverse this rock.

From 376 to 382 feet is a brecciated zone evidently caused by a shattering of the greenstone and the later passage of siliceous solutions containing some lead sulphide. Fragments of (a) amygdaloidal greenstone, and (b) dark brown felsite (silicified and bleached greenstone) cut by glassy quartz veins, are set in the quartz. The silica is microcrystalline to chalcedonic and contains veinlets of galena.

Specimen 385 forms the typical footwall rock of the shattered and brecciated zone. It is an amygdaloidal greenstone after basalt. Macroscopically it is a dark green fine-grained rock showing cleavage facets of felspar. Microscopically it is made up of small laths and microlites of felspar lying in all azimuths in a mass of chlorite and carbonates. Mixed quartz-carbonate veins traverse this rock. The specimens from 430 and 500 feet respectively indicate that the bore is still in greenstone.

No. 3 Bore, Ragged Hill.

Only three pieces of core were received from this bore. They have been reported on. The rocks referred to are:—

402ft.—Footwall just entering lode. A dense dark-green very fine-grained amygdaloidal basalt. The amygdules contain chlorite and quartz mosaics. The groundmass is considerably chloritised.

433ft.—Hanging wall just through the lode. Also a chloritised basalt, with red veinlets of ferruginous carbonates.

443ft.—Maximum depth obtained. Still in chloritised basalt.

No. 1 Bore, M.L. 291.

According to a report from the Government Analyst 4 inches of this core at 366 feet showed small specks of galena. The four inches of core assayed: lead 2.16 per cent.; zinc, nil; gold, nil; silver 1 dwt. 7 gr. per ton.

The core received by me came from between 342 and 385 feet. The bore passed through the following succession:—

342 to 355ft.—Amygdaloidal chloritised basalt. The amygdules were not abundant, and were filled with chlorite and calcite. Under the microscope the rock consists of abundant scales of chlorite and grains of leucoxene scattered throughout a mass of water-clear to clouded altered felspar with patches of secondary silica.

355 to 362ft.—Breccia of white silica with traces of galena and bleached leucoxenised amygdaloidal basalt. The basalt has been cut to pieces and shattered and then invaded by galeniferous siliceous solutions which cemented the whole mass into a breccia. Later carbonate veins cut the siliceous mass and breccia.

362 to 375ft. 6ins.—Amygdaloidal chloritised leucoxenic basalt with small patches of breccia and silicification. Galena-bearing veins cut this basalt. At 366ft. 7ins. a piece of core sectioned showed the contact of silicified leucoxenised and chloritised basalt with a siliceous vein made of both cryptocrystalline and microcrystalline silica. The silica was traversed by a network of microscopic veinlets of galena, and contained crystallised pyrites along its contact with the basalt. It was from this zone that the core assayed by the Government Analyst came.

383 to 385ft.—Amygdaloidal chloritised basalt with carbonate veins containing a little lead and copper sulphide.

No. 2 Bore, M.L. 291.

The core received from this bore came from between 76 and 110 feet. This bore contained a distinct argentiferous lead lode containing some zinc. It was made of somewhat granular galena mixed with greenstone but details cannot be given as the lode material was not seen intact.

The following are the assay results of core from 92 feet 8 inches to 100 feet submitted by the Government Analyst:—

Depth.	Lead. %	Zinc. %	Silver. oz.	dwt.	grs.	Gold.
92ft. 8in. to 94ft.	47·66	4·54	1	3	21	Nil.
94ft. to 95ft.	45·45	6·86	1	4	16	Nil.
95ft. to 96ft.	52·13	5·95	1	9	9	Nil.
96ft. to 97ft.	56·47	6·07	1	10	16	Nil.
97ft. to 98ft.	51·02	7·57	1	9	22	Nil.
98ft. to 99ft.	36·55	4·10	1	0	11	Nil.
99ft. to 100ft.	51·11	3·50	1	3	13	Nil.

The examination of the core from this bore gave the following results:—

76ft. to 79ft. ... ... Dark basaltic rock with quartz patches. The basalt has been shattered and penetrated by siliceous solutions which have cemented the whole mass into a breccia.

79ft. to 80ft. ... ... Shattered white glassy quartz.

80ft. to 82ft. ... ... Shattered basaltic greenstone riddled with veins and veinlets of quartz.

82ft. to 85ft. ... ... White glassy quartz with a little fine-grained galena and blende.

85ft. to 86ft. ... ... Black basaltic greenstone.

87ft. to 89ft. 6ins. ... Breccia.

89ft. 6in. to 92ft. 8in. ... Brecciated lode material with veinlets of microcrystalline silica containing shapeless ragged pieces of galena. Rotten greenstone—some carbonated, altered and impregnated with a little galena and pyrites—is mixed with the silica.

92ft. 8ins. to 100ft. — *Zinciferous and Argentiferous Galena Lode.*—(Assays given above).

100ft. to 110ft. ... Amygdaloidal and somewhat shattered basaltic greenstone with patches of breccia.

Baker's Bore.

Core was received from this bore between 280 and 320 feet.

From 280 to 305 feet the core consisted of highly chloritised and carbonated basaltic greenstone. The felspars have been almost destroyed though relicts remain, together with traces of amygdules.

From 305 to 320 feet is still more highly altered silicified basaltic rock with much quartz and carbonates.

Kennedy Junior Lease.

Core was received from between 373 and 417 feet. The rock from this bore was entirely different from all the other bores. It contained no lode material, altered basaltic greenstone or breccia. On the other hand it is a perfectly fresh black dolerite made of augite and fresh plagioclase.

Concluding Remarks.—The petrological investigations indicate that the country rock at Ragged Hill, M.L. 291, and Barker's Bore is made of altered chloritic amygdaloidal basalts, while that on Kennedy Junior Lease is entirely different and probably newer in age, viz., fresh dolerite.

The one marked feature revealed by the microscope is the pronounced zone of shattering which traverses the amygdules. Siliceous alkaline and carbonated solutions containing lead, zinc, silver and a little copper traversed this zone and deposited their contents, not only in the zone of brecciation, but in veins and veinlets in the amygdules associated with that zone. The formation of ore was apparently controlled by selective deposition, and in No. 2 Bore on M.L. 291 the concentration of lead sulphide was sufficient to make a distinctive lode.

Another feature is the occasional presence in places of a curious rock, to all intents and purposes a pinkish-brown felsite. It was recorded from the Ragged Hill and Barker's bores. For some time it appeared to be a dyke rock genetically connected with the lead-bearing solutions. But I was able finally to obtain sufficient evidence to indicate that it is the chloritised amygdaloidal basalt that has been intensely silicified and bleached by the action of the alkaline siliceous solutions that traversed the shattered channel. Fragments have been recognised as common constituents of the breccia, while in other places it may be seen grading into the darker greenstone from a typical brown rock.

The trachytic or bostonitic appearance of the rock under the microscope was quite misleading. It consisted of numerous laths and microlites of felspar, many with extinction angles straight, others with a maximum of 13 degrees and a refractive index less than balsam. These are set in a greatly silicified base of cryptocrystalline silica mainly.

The Government Analyst kindly submitted the following analysis:—

Silica	70·75
Alumina	15·09
Fe_2O_3	*1·36
CaO	·61
MgO	·50
Na_2O	2·20
K_2O	8·08
TiO_2	·81
Undetermined	·60
	100·00

*Including some FeO.

The siliceousness is immediately apparent, and if the potash, soda, and lime are allotted to felspar we get:—

	%
Orthoclase	47·73
Albite	18·60
Anorthite	3·01

It was only along the shatter zones that this rock was noted.

8.—REPORT ON BORING AT ENTERPRISE G.M., KALGOORLIE.

Introduction.—With a view to prospecting the deep levels, and searching for the downward extension of the ore-body known to exist at a depth of 504 feet and on which a winze was sunk from the 365 feet level, three horizontal bores were put out in a westerly and southerly direction from the 773 feet level in the Hainault Mine (752 in the Enterprise Mine).

The bores are as follow:—

No. 4—S. 26° 18′ west ... Length 207ft. 6ins.
No. 5—S. 60° west ... Length 195ft. 5ins.
No. 6—Due South ... Length 250ft.

General Geology of 752ft. Level.

The rock formations recognised, in these three bores, for economic purposes are as follow:—

1.—Quartz dolerite greenstone.
2.—Bleached quartz dolerite greenstone.
3.—Greyish white rock from 181ft. to 189ft. 9ins. in No. 5 Bore.
4.—Dyke rock—felsite (keratophyre).
5.—Lode formation.

1. *Quartz Dolerite Greenstone.*—This is the normal standard country rock of the Golden Mile. It is represented by 1/4770 at the commencement (5 feet) of the No. 4 Bore, where it continues from 0 to 104 feet. In the No. 5 Bore it is found between 0 and 108 feet, and in the No. 6 Bore from 0 to 95 feet.

In hand specimens it is a dark-green and somewhat mottled rock showing laths of altered felspar in a greenish admixture of chlorite and carbonates.

Under the microscope it consists of well-shaped ash-coloured rectilinear pseudomorphs of saussurite after felspar—pure white in reflected light and in places containing grains of magnetite. The ilmenite is mostly changed to leucoxene. Clear areas between the felspars are made of carbonates with some sericite. The rock is stained by green chlorite. Primary quartz plates, more or less broken up, are prominent.

2. *Bleached Quartz Dolerite Greenstone.*—This is mostly a cream or pinkish-coloured rock. The name is used to include Mr. Feldtmann's bleached greenstone (with dominant iron pyrites) and bleached magnetite rock (with dominant magnetite). This rock is important, especially the cream to white form with spots of magnetite, for the magnetite-bearing variety not only forms the rock enclosing the important lodes, but it is the rock from which the lode is formed directly by the addition of pyrites, gold, and so on.

In all the bore sections—Figures 1, 2, and 3—I have indicated a so-called "magnetite zone" which contains the lodes.

In hand specimens the rock is cream to white-coloured, somewhat pyritic quartz dolerite greenstone, showing in places "sheeny" (sericitised) surfaces with many "spots" of magnetite and yellowish-white skeletal forms of leucoxene.

Under the microscope the bulk of the rock is made of water-clear material, studded with carbonates. The former is mostly albitised felspar with a little but not much sericite and some fine-textured silica mosaic. Primary quartz, much cut to pieces and absorbed, is present. Albitisation and carbonation seem to dominate, together with a complete leaching of ilmenite and recrystallisation of magnetite. The magnetite occurs as irregular-shaped grains—in places somewhat segregated. Most of the magnetite has crystallised out separately, but some of it appears certainly to replace the leucoxene—as iron pyrites is known to do. A little pyrites may be seen. In the No. 5 Bore the bleached quartz dolerite greenstone about 170 feet takes on the appearance of a creamy-coloured felsite with black spots of magnetite.

3. *Greyish-white Rock from* 181 *feet to* 189 *feet* 9 *inches in No.* 5 *Bore.*—This is such a distinctive-looking rock that it is regarded separately. It is really only a variety of (2)—bleached quartz dolerite greenstone. It is a dense and almost felsitic grayish-white rock showing marked skeletal leucoxene and occasional quartz specks—also a slight bright-green staining in places.

Under the microscope the leucoxene is in skeletal masses—perfect creamy-white. The rock is essentially a mass of carbonate with a very little sericite. The primary quartz has been practically all absorbed, though distinct relicts may be recognised—mostly as isolated pieces. At 189 feet 7 inches the leucoxene has been almost crushed out of existence, but it is still recognisable. More sericite is present. This white rock is characterised by a total absence of magnetite with only traces of pyrites. More crushing would convert this rock into a carbonate-sericite schist. The intense alteration of this rock and obliteration of the magnetite may be due to its contact with the dyke and its proximity to the main ore channel at 752 feet level, where it strikes the dyke.

4. *Dyke Rock—Felsite* (*Keratophyre*).—The only bore that cut this rock was No. 5. It entered the dyke at 189 feet 9 inches and finished in dyke at 195 feet 5 inches. The first 4 feet of dyke rock—189 feet 9 inches-193 feet 9 inches—was lodestuff.

In hand specimens it is virtually a dense grayish felsite with a sub-resinous lustre and cut by minute quartz veinlets.

Under the microscope it is a more or less homogeneous mass of carbonates with sericite, traces of felspar microlites and some quartz.

5. *Lode Formation.*—Definite and distinct lode formations were cut on the 752 feet level at three points, viz., A, B and C, shown on plan, Plate I. These lodes occurred in:—

1. Bleached quartz dolerite greenstone at B and C, and
2. Dyke rock at A.

1. The lodes in bleached quartz dolerite greenstone (with magnetite) occurred at B and C. The lode material at both points B and C is lithologically the same, viz., dark gray siliceous pyritic and sericitised lodestuff. It has been formed by the complete carbonation, pyritification and in part silicification of the bleached magnetite-bearing quartz dolerite greenstone.

The ore consists of plates of very fine textured sulphide, which has been formed by replacement of the leucoxene. In addition, small patches, grains and crystals of iron pyrites are distributed throughout the ore. These are set in a mass of carbonates, secondary silica and some sericite. Primary quartz still exists in the form of large broken plates and "archipelagoes." In places some carbonated water-clear albite was recognised. A small shear track was noted. Well marked micropegmatite occurs in the ore between 105′ 8″ and 109′ in the No. 6 Bore.

The rock immediately adjoining the footwall shear plane of the lode at B. was a magnetite-bearing cream-coloured bleached quartz dolerite greenstone. The ilmenite has been completely changed to leucoxene and the latter mineral not only had a crushed drawn-out appearance, but it was distinctly replaced by magnetite. The footwall rock contains numerous irregular-shaped grains and patches of magnetite. The amount of fine-grained pyrites was small. The rock was otherwise made up largely of carbonates, much carbonated albite, shattered and replaced primary quartz, a little secondary silica and sericite scales. The addition of pyrites and gold—perhaps with more sericitization—to this rock makes lodestuff. In the change ilmenite apparently goes to leucoxene, then to magnetite, and finally pyrites (with or without the magnetite stage). The lodestuff at B, 178 feet along the No. 4 Bore, is controlled by a well-marked shear line. It is regarded as the main shear channel that controls the orebody at the 752 foot level, and may reasonably be linked up with the schisted lode in the dyke at "A." The assay results show that the perfect lodestuff at B is 4 feet wide, but the walls are impregnated sufficiently to make approximately an auriferous channel over about 12 feet in width.

The lodestuff at C, between 100ft. 8ins. and 111ft. 3ins. in No. 6 Bore, is quite typical and lithologically similar to that at B. It is hard to connect this lode with anything else on the evidence available. It may be the downward extension of Smith and Well's Lode or it may be entirely new. So far as the petrographic aspect is concerned, lodes B and C are of truly deep-seated origin.

Lode formation in dyke rock at A. This rock was cut at 189ft. 9ins. in the No. 5 Bore, exactly at the point where the bleached quartz dolerite greenstone contacts with the dyke. It extended over four feet in width to 193ft. 9ins. The ore is simply a pyritic gray carbonated schist in hand specimens.

Under the microscope, it is a mass of shapeless carbonate with sericite scales, a little quartz and grains of pyrites—with a tendency for arrangement along foliation planes.

This lode, in strongly schisted dyke rock, suggests the northerly extension of the lode at B. If this is so, it is reasonable to expect the main ore body at 752 feet to lie between the points A and B, for at these points the occurrences are quite analogous to those at points X and Y on the 365 foot level.

Description of Individual Bores.

No. 4 Bore.

Rock Formations.—As shown in the diagram, Figure 1, this bore started in normal quartz dolerite greenstone of mottled appearance and continued in this rock to 104 feet. From 104 feet to the end of the bore—207 feet 6 inches—the rock was a pale-coloured bleached quartz dolerite greenstone, studded with grains of magnetite and containing more or less pyrites. The dyke rock was not cut in this bore, but it would have been better had the bore been pushed on to meet the dyke.

Lode Formations and Values.—At three places along this bore there were definite signs of lodestuff, viz:—

(1) 130 to 132 feet.—Between these two points the core assayed 13 dwts. 1 gr. of gold per ton. Mr. Feldtmann described this core as "intensely pyritic, practically lode." In my notes I noted between these points "heavily pyritic rock, consisting of patches of fine sulphide in bleached quartz dolerite greenstone—virtually lodestuff."

(2) 146 to 148 feet.—Between these points the assay results were:—

					Gold per ton.	
ft.	in.		ft.	in.	dwt.	grs.
146	0	to	148	0 ...	... 1	21
148	0	„	150	0 ...	... 0	14
150	0	„	152	0 ...	... 5	8

Mr. Feldtmann describes the rock between 145ft. 8ins. and 151ft. 1in. in such terms as, "intensely pyritic sericitic lode; very fine-grained cherty lode with finely disseminated pyrite, bleached magnetite

rock and white quartz vein with a little carbonate and pyrite." I noted "real siliceous pyritic lodestuff from 145ft. 8in. to 147ft. with fine sulphide in strongly-bleached greenstone."

(3) At 178 feet a well-marked shear track was cut, and there were three feet of distinct lode from 178 to 181 feet. For three feet on the eastern side and six feet on the western side of the lode, a zone of impregnation was noted, thus making about 12 feet of an auriferous* zone between 175 and 187 feet. The assay values from this zone are:—

Core.

ft.	in.		ft.	in.			Gold per ton. dwt.	grs.
154	9	to	177	0	...	...	0	14
177	0	„	179	0	...	...	5	11
179	0	„	181	0	...	...	4	6
181	0	„	183	0	...	...	2	1
183	0	„	185	0	...	...	1	21

It is reasonable to suggest that this is the main channel, and it is possible that it connects us with the lodestuff cut in the dyke met with in the No. 5 Bore at 189ft. 9in.

The Company was good enough to supply the following assay results of core from the No. 4 Bore, as follows:—

No.	Depth. ft.	in.		ft.	in.			Assay result: Gold. dwts.	grs.
1	from 129	0	to	130	0	...	...	0	14
2	„ 130	0	„	132	0	...	...	13	1
3	„ 132	0	„	134	0	...	...	0	18
4	„ 134	0	„	136	0	...	...	0	18
5	„ 136	0	„	138	0	...	...	0	16
6	„ 138	0	„	140	0	...	...	0	14
7	„ 140	0	„	142	0	...	...	0	16
8	„ 142	0	„	144	0	...	...	0	16
9	„ 144	0	„	146	0	...	...	0	16
10	„ 146	0	„	148	0	...	...	1	21
11	„ 148	0	„	150	0	...	...	0	14
12	„ 150	0	„	152	0	...	...	5	8
13	„ 157	0	„	160	0	...	...	0	12
14	„ 167	0	„	170	0	...	...	0	12
15	„ 174	9	„	177	0	...	...	0	14
16	„ 177	0	„	179	0	...	...	5	11
17	„ 179	0	„	181	0	...	...	4	6
18	„ 181	0	„	183	0	...	...	2	1
19	„ 183	0	„	185	0	...	...	1	21
20	„ 115	0	„	117	0	...	...	1	20
21	„ 117	0	„	119	0	...	...	0	18
22	„ 119	0	„	121	0	...	...	0	20
23	„ 121	0	„	123	0	...	...	1	0
24	„ 123	0	„	125	0	...	...	0	16
25	„ 125	0	„	127	0	...	...	0	13

No. 5 Bore.

The No. 5 Bore was started in quartz dolerite greenstone, in which it continued to about 108 feet. Some magnetite occurred in part of this greenstone (Mr. Feldtmann's magnetite rock).

From 108 to 181 feet the core consisted of more or less bleached quartz dolerite greenstone, containing magnetite and, in places, pyrites. From 181 to 189ft. 9in. there occurs a remarkable perfectly bleached quartz dolerite greenstone, pale-gray and felsitic without magnetite and showing prominent leucoxene with traces of primary quartz. At 189ft. 9in. the bore entered a dense grayish felsite dyke which continued to the end of the bore, viz., 195ft. 5in.

Lode Formation and Value: (a) The most important discovery in this bore was the four feet of schisted pyritic lode between 189ft. 9in. and 193ft. 9in. at the place where the intensely-bleached greenstone immediately contacts with the large felsitic dyke. The schisted zone is 4 feet wide and quite strong. It indicates the almost certain northerly extension of the main lode channel met with at 178ft. in No. 4 bore. The lode material consisted of schisted carbonated and sericitised dyke (keratophyre?) with white quartz veins parallel with the planes of schistosity. This discovery may be regarded as the most definite indication of the possible presence of the main ore channel so far met with the boring at the 752ft. level. The lode material assayed 23s. 10d. per ton.

(b) In addition to the lode in the dyke, only at one place—110 feet—was any trace of pure lodestuff met with in the bleached quartz dolerite greenstone. At this point there was distinct lodestuff with traces of incipient shear planes. Mr. Feldtmann describes the rock from 110ft. to 110ft. 2in. as "crumbled fragments of which 65 per cent. was bleached magnetite rock, and 35 per cent. highly pyritic and practically lode." The core from 107ft. 8in. to 112ft. 2in. only assayed from traces to 14 grains of gold per ton.

(c) From 145 to 153 feet the core assayed 5s. 3d. per ton. Mr. Feldtmann says this core contained planes with sericite and tourmaline. Between 149ft. and 152ft. 6in. it was highly pyritised.

(d) From 165ft. 9in. to 167ft. 6in. the rock was distinctly auriferous and contained gold to the value of 7s. 5d. per ton. The rock was pyritic and for the most part heavily-bleached quartz dolerite greenstone, cut by glassy quartz veins, and in one place a vein of quartz, chlorite and pale-brown carbonate. Some of the rock had the appearance of incipient lodestuff and was suggestive of vein-altered wall rock. This occurrence may possibly be attributed to the proximity of the main channel to the southward and the dyke, which is only 23 feet away.

No. 6 Bore.

The No. 6 Bore started in normal quartz dolerite greenstone, which continued (with slight bleaching between 83 and 86 feet) right up to within 5 feet (95 feet) of the lode. At 95 feet the rock became strongly bleached with introduction of magnetite and some pyrites, and finally passes into lode at 100ft. 8in. From 100ft. 8in. to 111ft. 3in., *i.e.*, 10ft. 7in.,† the core passed through typical lodestuff. Bleached rock then continued from 111ft. 3in. to 195ft. At 195ft. the rock is practically quartz dolerite greenstone which continued to the end of the bore—250ft. No dyke rock was met with in this bore.

Lode Formation and Values.—A prominent lode, marked "C" on plan (Plate I.), was cut in this bore between 100ft. 8in. and 111ft. 3in. It consisted of nice looking dark-gray siliceous, pyritic, and silicified lodestuff. The pyrites is in patches, grains and streaks along minute shear lines. The assay values given by the company are as follows:—

Distance along Bore. ft.	in.		ft.	in.			Gold per ton. dwt.	grs.
100	8	to	103	8	...	...	2	18
103	8	„	105	8	...	...	6	1
105	8	„	109	0	...	...	11	12
109	0	„	110	6	...	...	10	10
110	6	„	111	3	...	...	2	21

* All values in this report are from assays made by the Company. † 3ft. 6in. of this core was lost.

In addition to the above lode, values were met with under the following conditions:—

(1) From 114ft. 7in. to 114ft. 10in. was 3 inches of true lodestuff assaying 5 dwts. 2 grs. of gold per ton. This is probably a "dropper" or "feeder" connected with the chief lode met with in this bore, between 100ft. 8in. and 111ft. 3in.; or it may indicate an increased width of auriferous channel.

(2) From 123ft. 2in. to 125ft. 2in. the core assayed 1 dwt. 10 grs. of gold per ton. This section of core is described by Mr. Feldtmann as "practically bleached quartz dolerite greenstone with magnetite, streaky with very much dark bluish iron ore, probably haematite. Only about one inch of rock containing a fair amount of pyrite and approaching lode."

(3) From 132 to 135ft. 2in. the core assayed 1 dwt. 3 grs. of gold per ton. Mr. Feldtmann describes the section as consisting of "slightly streaky and veined bleached quartz dolerite greenstone with magnetite. A fair amount of sericite, some pyrite, and probably some haematite, are present. Clusters of tourmaline needles occur in places."

(4) From 190ft. 6in. to 191ft. 11in. in the core assayed 2 dwts. 1 gr. of gold per ton. This zone consisted of powerfully bleached quartz dolerite greenstone of white to pink colour and traversed by a small group of distinct shear tracks. This locality is important because it may represent the southern extension of the line of weakness which controls the main ore body met with in the No. 4 Bore at 178 feet.

General Remarks and Conclusions.

Some interesting scientific and economic features have resulted from a detailed petrographical investigation of the cores from the three bores put out at the 752 feet level of the Enterprise Gold Mine.

These may be enumerated as follow:—

(1) The boring has revealed the definite existence of lode channel and values at 773 feet (Hainault) vertical depth (752 feet Enterprise), 250 feet below the deepest workings in the Enterprise Mine.

(2) A careful examination of the core from the No. 5 Bore has shown (a) that the dyke rock has been thrown back 189 feet 9 inches from the Hainault boundary. At the point A shown on the plan, Plate I., the main lode channel enters the dyke where it is well schisted, pyritic, and contains gold to the value of 23s. 10d. per ton. The schisted channel is here (point A) 4 feet wide, and its existence proves that the dynamic forces have broken the dyke rock down into schist and so formed a line of weakness for the passage of auriferous solutions.

(3) The examination of the No. 4 Bore proved the existence of a well-marked shear line at 178 feet as shown at B in the plan, Plate I. At this point true lodestuff exists from 178-181 feet, and if the impregnations on either side of this lode be taken into consideration, a 12-ft. auriferous channel exists —as shown by the assay results indicated on the geological section through the bore—Figure 1. This shear line may be regarded as the guiding feature in the main trunk channel that controls the ore bodies at the 504ft., 365ft., and 270ft. levels.

(4) The petrographic investigations show that lithologically, microscopically, and mineralogically, the ore in the channel at points A and B on the 752ft. level is identical with the ore in the channel at the northern and southern extensions of the ore-body (X and Y, Plate I.) at the 365ft. level. It is therefore reasonable to suggest that the real ore-body, should values continue, lies between points A and B at the 752ft. level—Plate I.

(5) The economic deductions drawn from the petrographic examination, coupled with plotting of the results, are that the keratophyre dyke is the controlling element in the Enterprise ore shoot. There has been a concentration of ore solutions up against the dyke on its footwall side, and for about 100 feet back (southerly) from the dyke the rock has been extensively replaced and metasomatised so as to form a large body of ore.

(6) A first glance at the plan, Plate I., is likely to give a false impression and make one believe that the pitch of the ore shoot is roughly 25° east of south. For this reason too much reliance was placed on No. 6 Bore. The position now appears to be that, owing to the controlling part played by the dyke, the pitch is more likely to be as indicated on the plan, Plate I.; considerably to the east of south.

(7) After all, if bores had been put out at 365 and 504 feet, to cut the lode at these levels, 100 feet southerly from where the lode channel enters the dyke, they would in all probability not have met with results any better than those in No. 4 Bore at 752 feet.

(8) The ground between points A and B at 752 feet should certainly be tested, and the lode at 504 feet should be driven northward until the channel enters the dyke.

(9) There is no doubt whatever, about the deep-seated origin of the ore in the lodes at A, B, and C at 752 feet and it should certainly continue to greater depths.

In conclusion it might be stated that even now this mine has not been sufficiently prospected, for apart from the possibilities between A and B at 752 feet and the existence of the main Enterprise Shoot, the lode at 100 feet 8 inches to 111 feet 3 inches is of considerable interest. It may or may not be the downward extension of Smith and Wells' lode. On the other hand it may be a new lode all together. It now remains to consider the position of this mine with regard to lodes known to exist in the Hainault, South Kalgurli, and Perseverance mines.

9.—PETROGRAPHICAL DETERMINATIONS IN CONNECTION WITH THE GEOLOGICAL SURVEY OF KALGOORLIE.

This work was carried on continuously throughout the year in conjunction with Mr. Feldtmann, who is conducting the field work.

10.—PETROGRAPHICAL EXAMINATION OF SOME ORE FROM WILUNA.

Two interesting samples of ore in the dyke rock were examined. A description of them is as follows:—

(1) Macroscopically this rock (ore) is a fine-textured grey to white mass of silica and carbonates, impregnated with small grains and occasional crystals of iron pyrites and needle-like forms of mispickel. This mass encloses pale olive-green lumps of

highly altered dyke rock, cut by minute quartz veinlets. The ore is really a breccia made of fragments of dyke rock cemented by carbonate-quartz veins, the whole mass containing iron pyrites and mispickel. Microscopically the breccia is seen to consist of fragments of dyke rock strongly impregnated with rounded grains and occasional crystals of iron pyrites with subordinate needle-like forms of mispickel. The dyke rock is cut by two sets of veins and veinlets. In places these veins became sufficiently large and numerous to cut up the dyke rock in such fashion as to make a breccia out of it.

The older and ore-forming set of veins are made of carbonates mainly, with quartz, a little felspar, grains and crystals of iron pyrites and needle-like forms of mispickel. The sulphides, however, are mainly in the dyke fragments of the breccia.

In addition there is a newer set of veinlets of carbonates and quartz which cut through the older veins and are themselves devoid of sulphides.

It was the solutions from the older veins that metasomatically altered and impregnated the dyke rock and lumps in the breccia with very fine-grained iron pyrites and small needles of mispickel.

(2) Macroscopically this ore is a breccia made of lumps and patches of greatly bleached dyke rock strongly impregnated with grains of iron pyrites and rods of mispickel. The whole of these lumps are cemented by glassy white quartz and chalcedony together with carbonates in the form of patches and veins. Small grains of iron pyrites and rods of mispickel occur in the cementing material. Microscopically the rock is seen to consist of bleached carbonated dyke rock (keratophyre?) made up of abundant small microlites of carbonated plagioclase lying in all azimuths, in a carbonated cryptocrystalline groundmass of probably quartz and felspar. Grains and occasional crystals of iron pyrites, together with small needle-like forms of mispickel, are scattered throughout the bleached dyke rock. Patches and veins of carbonates and quartz with a little felspar and pyrites occur in places; a prominent vein of carbonates, quartz, chalcedony and a little pyrites formed a feature in this section.

General Remarks.—In the Annual Report for 1925, page 23, I divided the rocks at the Wiluna mine into (a) quartz dolerite greenstone; (b) fine-grained greenstone ("calc schist"); (c) felsite (keratophyre?); and (d) porphyrite.

The main ore body occurs in (a) and (b), though low-grade ore was recorded from (c). Samples 2 and 3 are the same, viz., ore formed in (c), *i.e.*, brecciated dyke (keratophyre?) impregnated with iron pyrites and mispickel.

It would be interesting if the ore in dyke rock carries payable values.

APPENDIX.

LIST OF FOSSILS COLLECTED BY H. W. B. TALBOT AND F. R. FELDTMANN FROM THE WOORAMEL RIVER DISTRICT, W.A., IN MARCH, 1929, AND IDENTIFIED BY MISS L. HOSKING, B.A., OF THE UNIVERSITY OF W.A.

Bogadi Outcamp, seven miles south of Survey Station R18, Wooramel:

Spirifer rostalinus (n. sp.) casts, Hosking. (1/4692.)
Spirifer rostalinus var auritus (var. nov.), Hosking. (1/4693.)
Spirifer (?) byroensis, Glauert, cast. (1/4694.)
Deltopecten subquinquelineatus var. comptus, Dana. (1/4697), (1/4698), and (1/4699).
Fragment of cast of (?)Ptychomphalina. (1/4696.)
Conularia cf. C. Warthi, Waagen. (1/4695.)

Two Miles E.S.E. of Survey Station R20:

Dielasma cymbaeformis, Morris. (1/4644.)
Spirifer rostalinus (n. sp.), Hosking. (1/4640), (1/4641.)
Cardiomorpha blatchfordi (n. sp.), Hosking. (1/4642.)
Deltopecten subquinquelineatus var comptus, Dana. (1/4643.)
Ptychomphalina maitlandi, Eth. fil. (1/4646.)
Conularia cf. C. Warthi, Waagen. (1/4645.)

South Bank of Wooramel, three miles above Survey Station R20, Wooramel:

Aulosteges ingens (n. sp.). (a. in F. R. Feldtmann's Colln.)
Spirifer rostalinus var crassus (var. nov.), Hosking. (1/4649.)
Deltopecten subquinquelineatus var comptus, Dana. (1/4648.)
Ptychomphalina maitlandi, Eth. fil. (1/4647.)

Creek half mile west of Callytharra Springs:

Clisiophyllum talboti (n. sp.), Hosking. (1/4660.)
Pleurophyllum australe Hinde. (8491 Univ. Colln.) and (1/4700.)
Crinoid plate and section of stem. (1/4652.)
Crinoid stems. (1/4663.)
(?) Coscinum. (1/4651.)
Polyzoa including:—
E. Fenestella horlogia, Bretnall
D. Aetomacladia ambrosoides Bretnall } (1/4664.)
I. Sulcoretepora meridianus Eth. fil
Chonetes pratti, Davidson. (1/4657.)
Cleiothyris macleayana, Eth. fil. (1/4650.)
Dielasma sp. (1/4662.)
Productus semireticulatus, Martin. (1/4654.)
Productus subquadratus, Morris. (1/4655.)
Productus tenuistriatus var foordi, Eth. fil. (1/4656.)
Prodctus tennistriatus var foordi, Eth. fil. (cast). (1/4653.)
Reticularia lineata, Martin. (1/4661.)
Spirifer hardmani, Foord. (1/4659—a.)
Spirifer musakheylensis, Davidson. Young specimen. (1/4659.)
Spiriferella australasica, Eth. fil. (1/4658.)

South Bank of Wooramel, quarter mile above Callytharra Springs.

Crinoid stems. (1/4675.)
Fenestella fossula, Lonsdale. (1/4670.)
Chonetes pratti, Davidson. (1/4672.)
Cleiothyris macleayana, Eth. fil. (1/4671.)
Productus semireticulatus, Martin. (1/4668.)
Productus tenuistriatus var foordi, Eth. fil. (1/4669.)
Productus "undatus," Defrance. (1/4667.)
Reticularia lineata, Martin. (1/4674.)
Spiriferella australasica, Eth. fil. (1/4666.)
Strophalosia (n. sp.). (1/4673.)

**From one mile from South Bank of Wooramel*, one mile above Callytharra Springs:

Shale containing crinoid stems, echinoid plate and polyzoa, including:— (1/4679.)
A. Fenestella fossula, Lonsdale.
B. Rhombopora multigranulata, Bretnall.
C. Streblotrypa marmionensis, Eth. fil.
D. Aetomacladia ambrosoides, Bretnall.
E. Fenestella horlogia, Bretnall.
Cleiothyris macleayana, Eth. fil. and Productus "undatus," Defrance. (1/4677.)
Deltopecten subquinquelineatus var comptus, Dana. (1/4678.)

South Bank of Wooramel, below Callytharra Springs:

Pleurophyllum australe, Hinde. (1/4700.)
Crinoid stems, one enlarged by fungal growth (cf. Bull. 10 G.S.W.A. p. 25, pl. 4). (1/4685.)
Polyzoa A—E as above, also H. Rhombopora mammillata, Bretnall. (1/4688.)
Aulosteges spinosus (n. sp.), Hosking. (1/4687.)
Chonetes pratti, Davidson. (1/4684.)
Cleiothyris macleayana, Eth. fil. (1/4686.)
Productus tenuistriatus var foordi, Eth. fil. (1/4683.)
Spirifer musakheylensis var australis, Foord. (1/4680.) Young specimen.
Spiriferella australasica, Eth. fil. (1/4681.)
Cardiomorpha (?) blatchfordi (n. sp.), Hosking. (1/4701.)
Parallelodon sp. (1/4682.)

South Bank of Wooramel, one mile above Callytharra Springs:

Productus "undatus," Defrance. (1/4689.)
Productus semireticulatus, Martin; and Spiriferella australasica, Eth. fil. (1/4691.)
Productus tenuistriatus var foordi, Eth. fil. (1/4690.)

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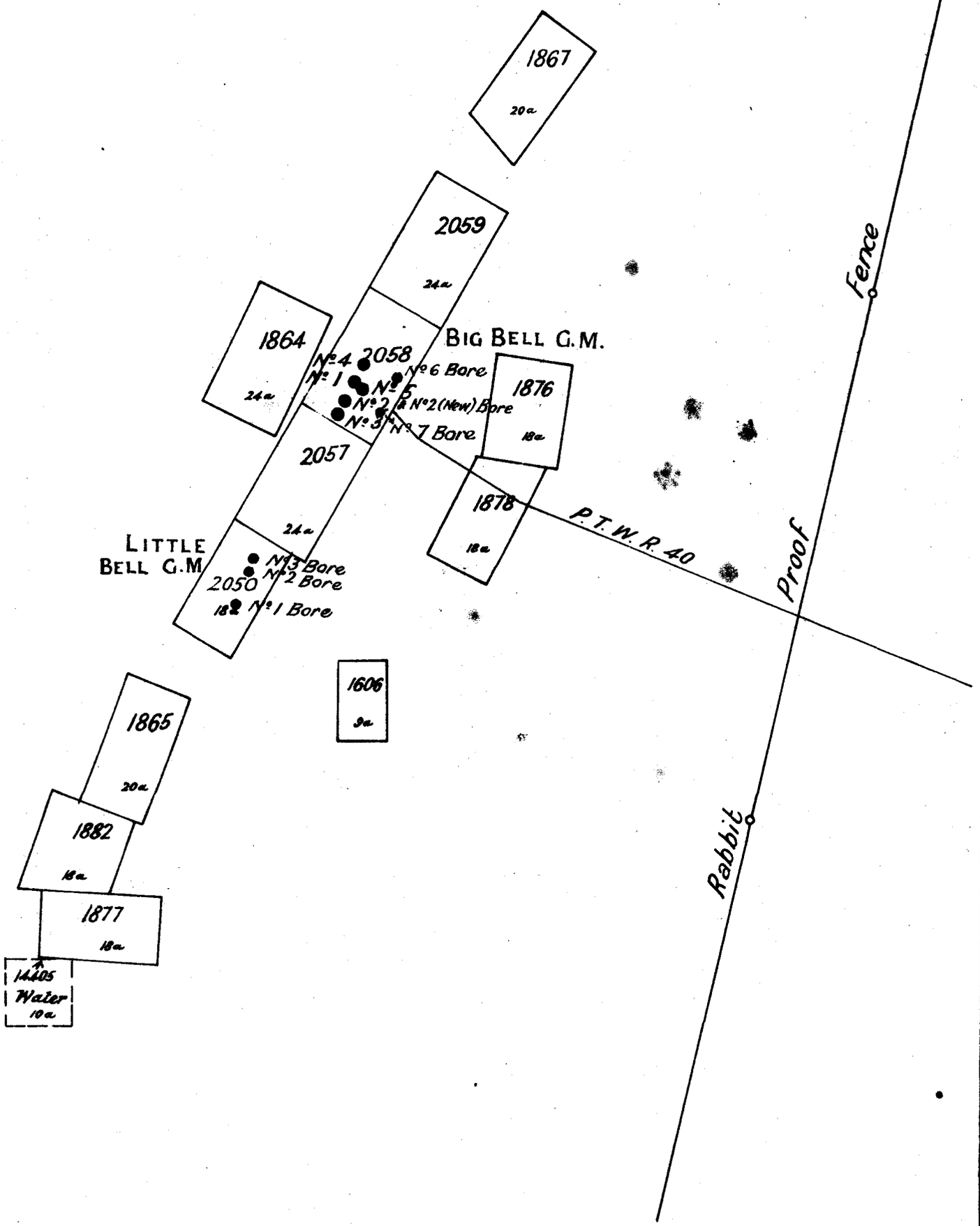
* There has been some mistake in the labelling of these specimens, as according to Mr. Talbot no fossils were collected at this locality.

Notes on the fossils listed above, with descriptions and illustrations of new species, are to be published shortly.

INDEX.

Locality Plan
of Bores at
BIG BELL
COODARDIE
— Scale :- 20 Chs. to an In. —



— Section Nº 3 Bore —

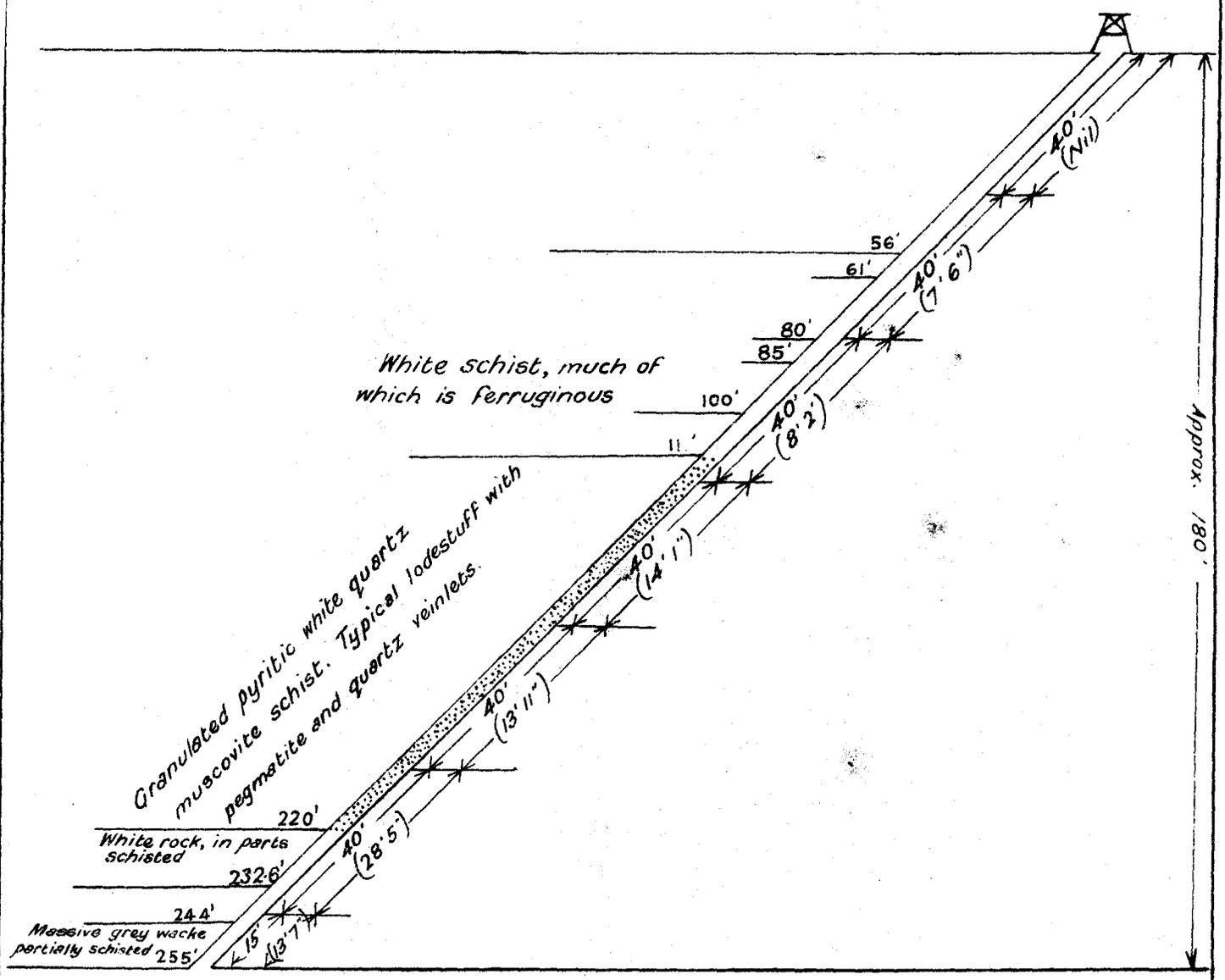
— Big Bell G.M. —

— Cue —

— Scale: 32 Ft. = 1 In. —

Depressed at an angle of 45°

Commenced 17. 1. 29.
Completed 4. 2. 29.



NOTE:—

The figures in brackets indicate the length of cores recovered from the corresponding section of boring.

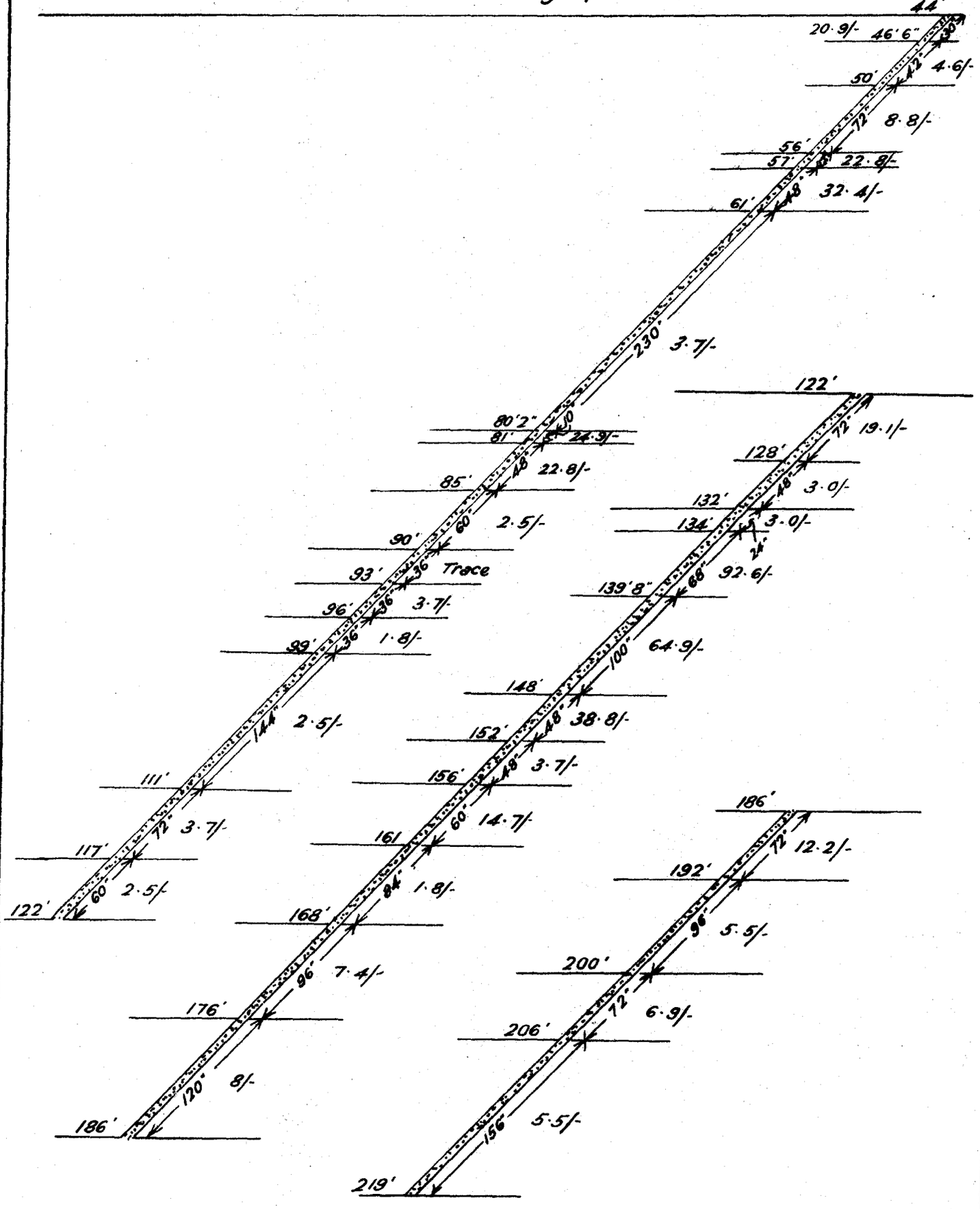
— No 3 Bore —

— Big Bell G.M. —

— Cue —

— Scale :- 8 Ft. = 1 In. —

Chart of Assay values in lode material pierced between 44 ft & 219 ft. in shillings per ton.



— Section No 4 Bore —

— BIG BELL G.M. —

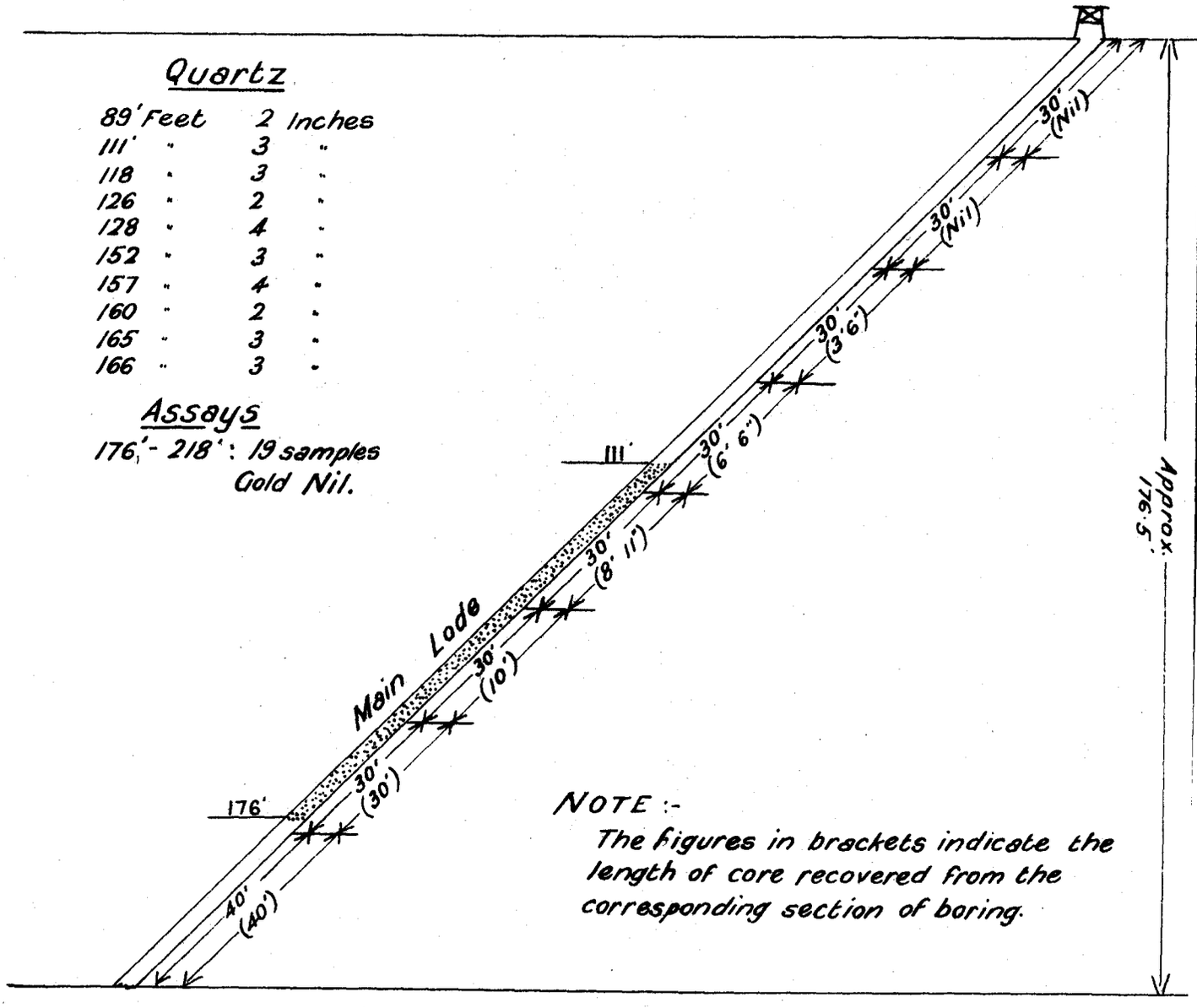
— CUE —

— Scale :- 30 Ft. - 1 In. —

Depressed at an angle of 45°

Commenced 12. 2. 29.

Completed 1. 3. 29.



NOTE :-

The figures in brackets indicate the length of core recovered from the corresponding section of boring.

Extract from Petrologist's Report :-

This bore is the furthest North of the seven bores put down It is 200 feet Northerly from the No 1 Bore & 60 feet Northerly from the open cut. The results above show that values and lode formation persist as far North as this bore.

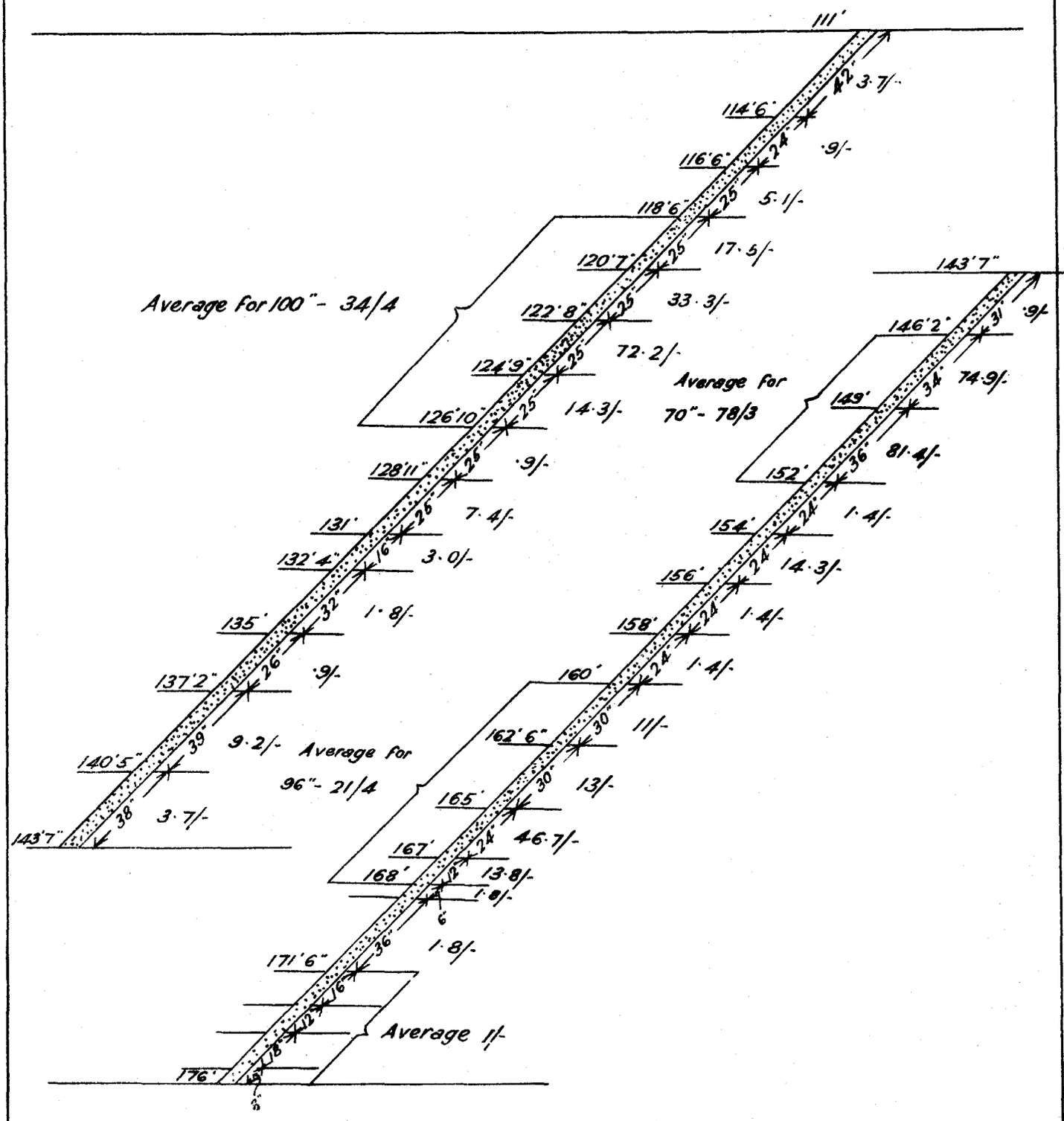
— No 4 Bore —

— BIG BELL G.M. —

— CUE —

— Scale :- 4 Ft. = 1 In. —

Assay chart of values pierced between 111' and 176' in shillings per ton.



—Section No 5 Bore—

— BIG BELL G.M.—

— CUE —

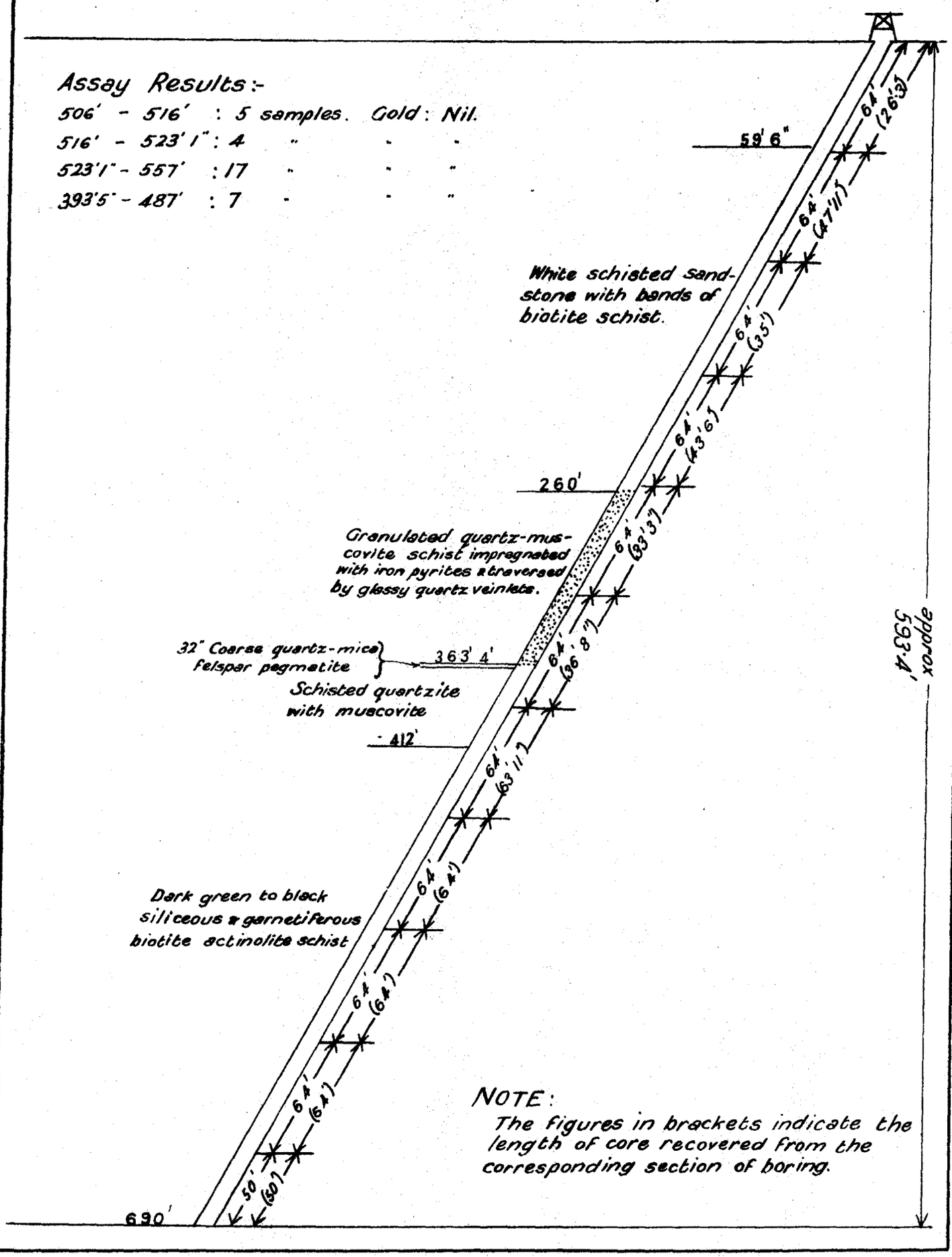
— Scale :- 64 Ft. - 1 In. —

Depressed at an angle of 60°

Commenced 9. 3. 29.
Completed 4. 5. 29.

Assay Results :-

506' - 516' : 5 samples. Gold : Nil.
516' - 523' 1" : 4 " " "
523'1" - 557' : 17 " " "
393'5" - 487' : 7 " " "



NOTE:
The figures in brackets indicate the length of core recovered from the corresponding section of boring.

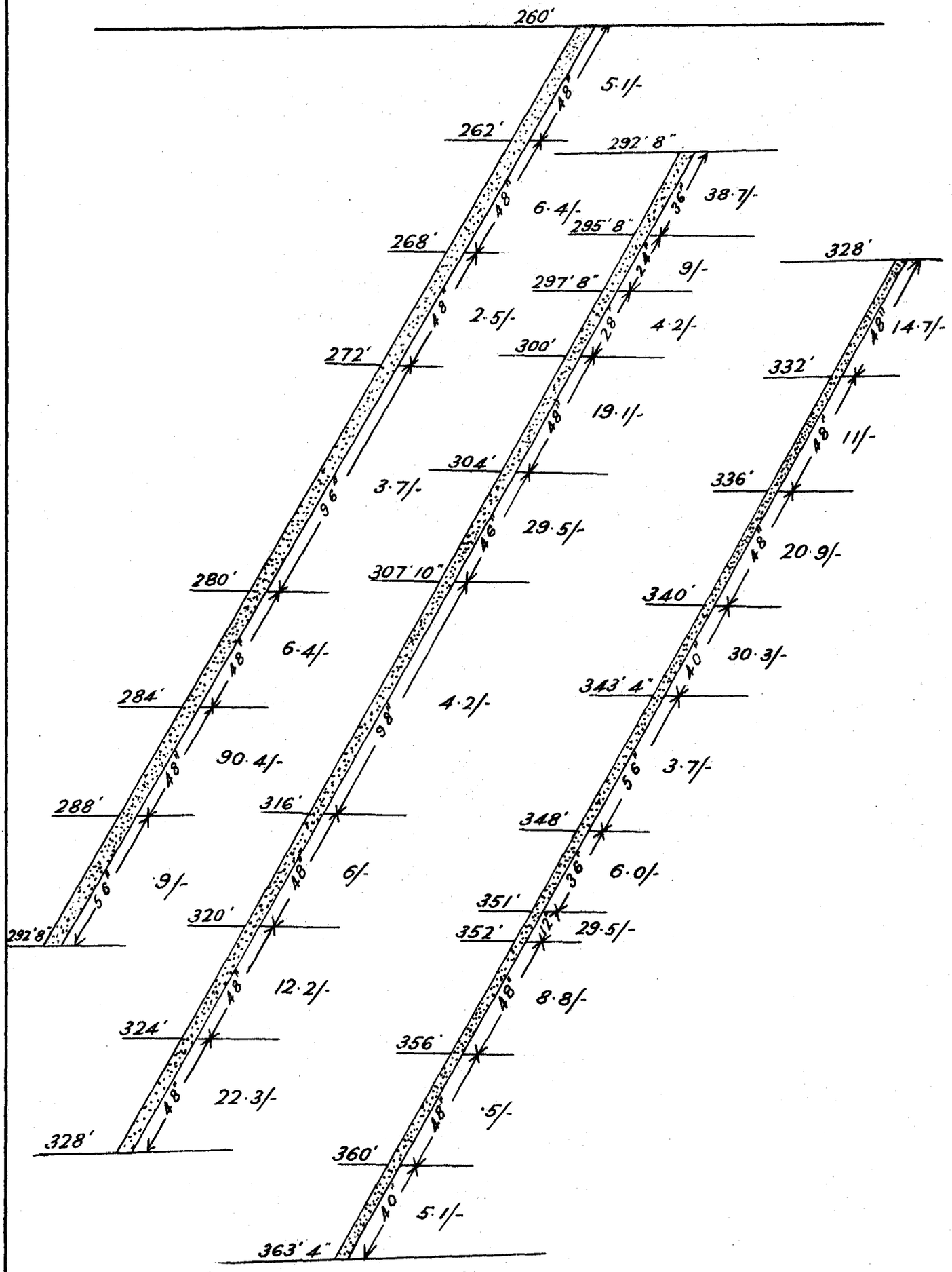
— No 5 Bore —

— Big Bell G.M. —

— Cue —

— Scale:- 4 Ft. = 1 In. —

Chart of assay values in ore pierced between 260' and 363'4", in shillings per ton.



— Section No 6 Bore —

— BIG BELL G.M. —

— CUE —

— Scale :- 64 Ft. = 1 In. —

Depressed at an angle of 60°

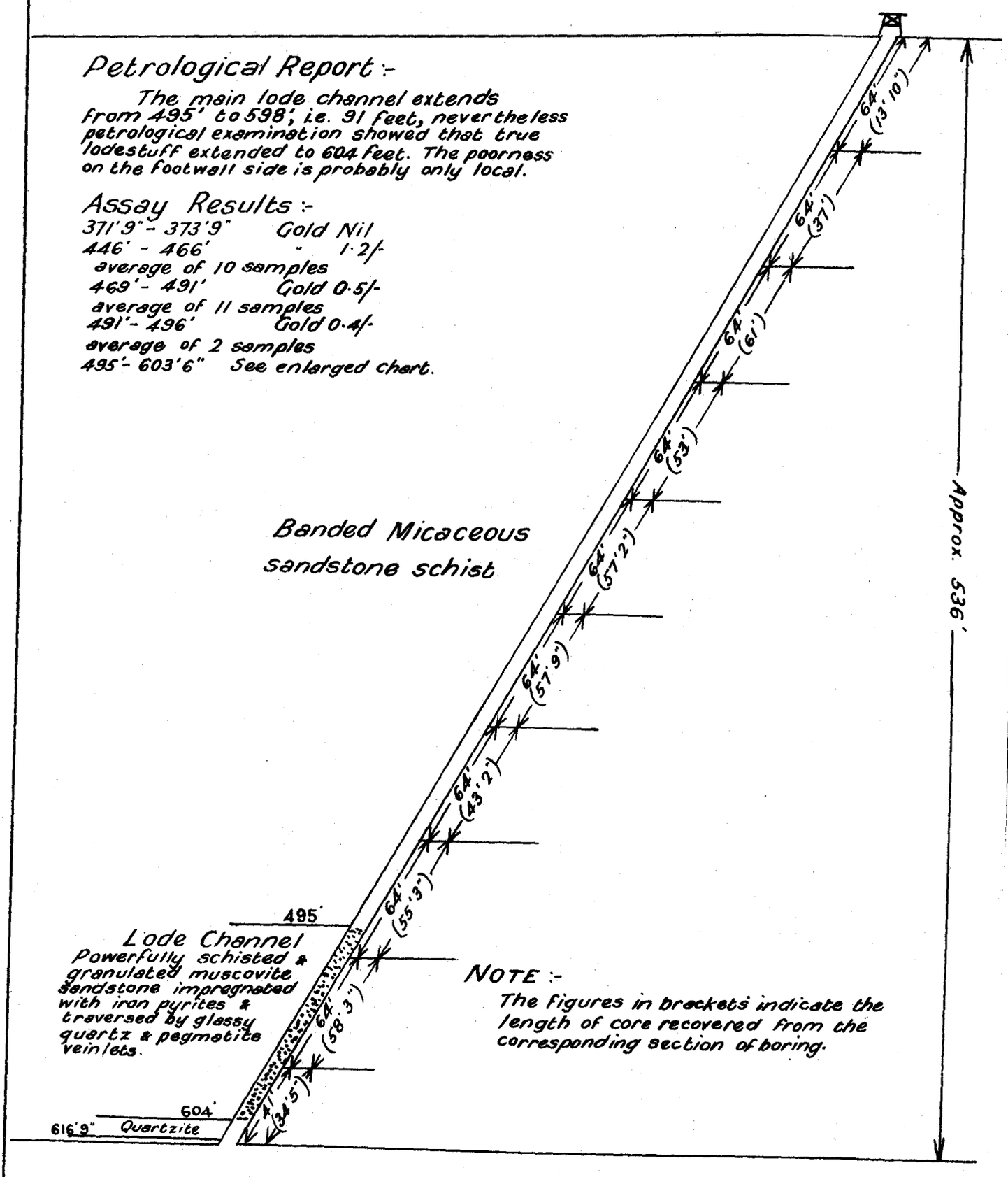
Commenced 17. 5. 29
Completed 10. 7. 29.

Petrological Report :-

The main lode channel extends from 495' to 598'; i.e. 91 feet, nevertheless petrological examination showed that true lodestuff extended to 604 feet. The poorness on the footwall side is probably only local.

Assay Results :-

371'9" - 373'9" Gold Nil
446' - 466' " 1·2/-
average of 10 samples
469' - 491' Gold 0·5/-
average of 11 samples
491' - 496' Gold 0·4/-
average of 2 samples
495' - 603'6" See enlarged chart.



NOTE :-
The figures in brackets indicate the length of core recovered from the corresponding section of boring.

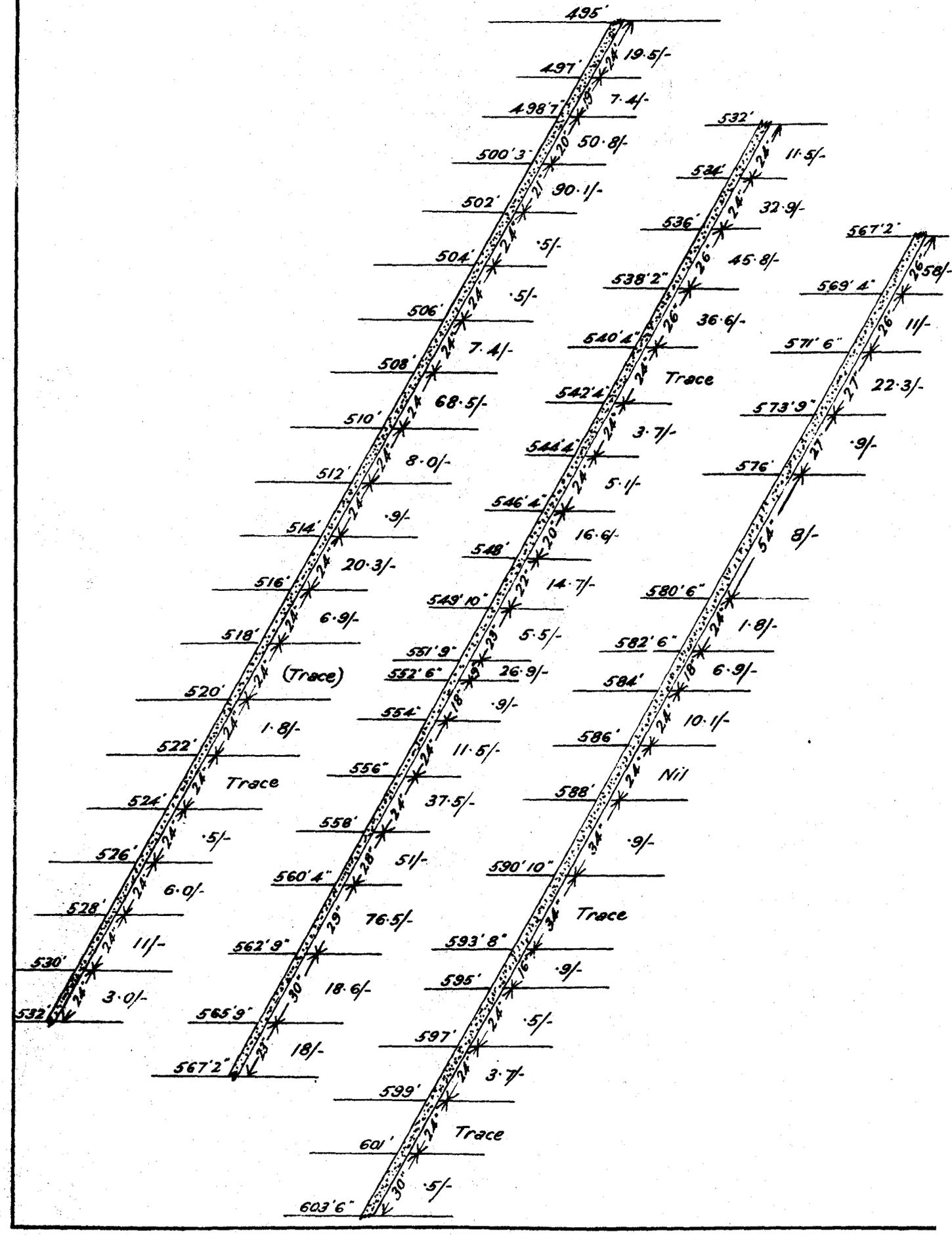
- N°6 Bore -

- BIG BELL G.M. -

- CUE -

- Scale :- 4 Ft. = 1 In. -

Chart of assay values in ore pierced between 495' and 603'6", in shillings per ton.



— Section No 7 Bore —

— BIG BELL G.M.—

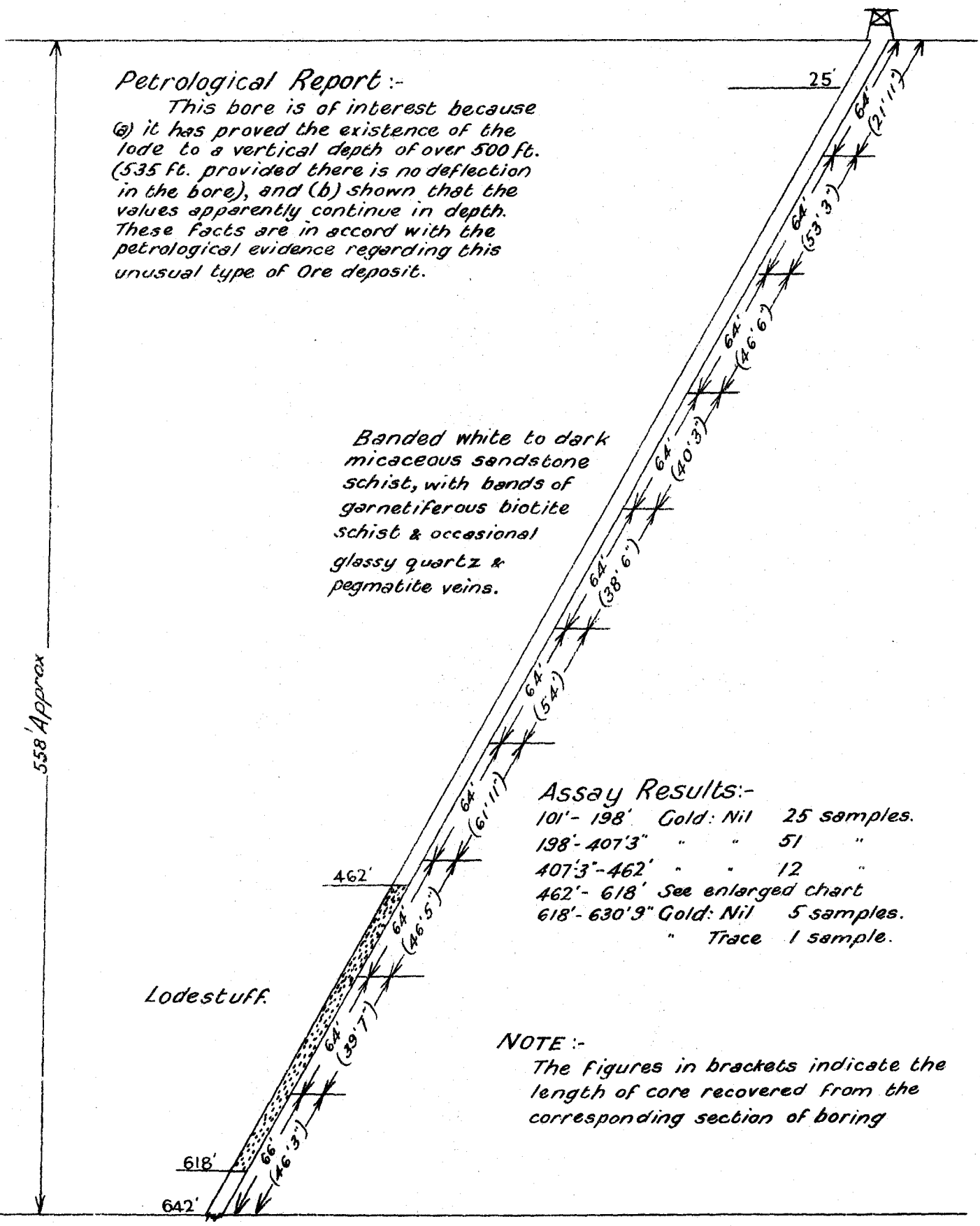
- CUE -

— Scale :- 64 Ft. = 1 In.—

Depressed at an angle of 60°

Commenced 19. 7. 29.

Completed 29. 8. 29.



Petrological Report :-

This bore is of interest because (a) it has proved the existence of the lode to a vertical depth of over 500 ft. (535 ft. provided there is no deflection in the bore), and (b) shown that the values apparently continue in depth. These facts are in accord with the petrological evidence regarding this unusual type of Ore deposit.

Banded white to dark micaceous sandstone schist, with bands of garnetiferous biotite schist & occasional glassy quartz & pegmatite veins.

Lodestuff.

Assay Results:-

101' - 198'	Gold: Nil	25 samples.
198' - 407'3"	" "	51 "
407'3" - 462'	" "	12 "
462' - 618'	See enlarged chart	
618' - 630'9"	Gold: Nil	5 samples.
	" Trace	1 sample.

NOTE :-

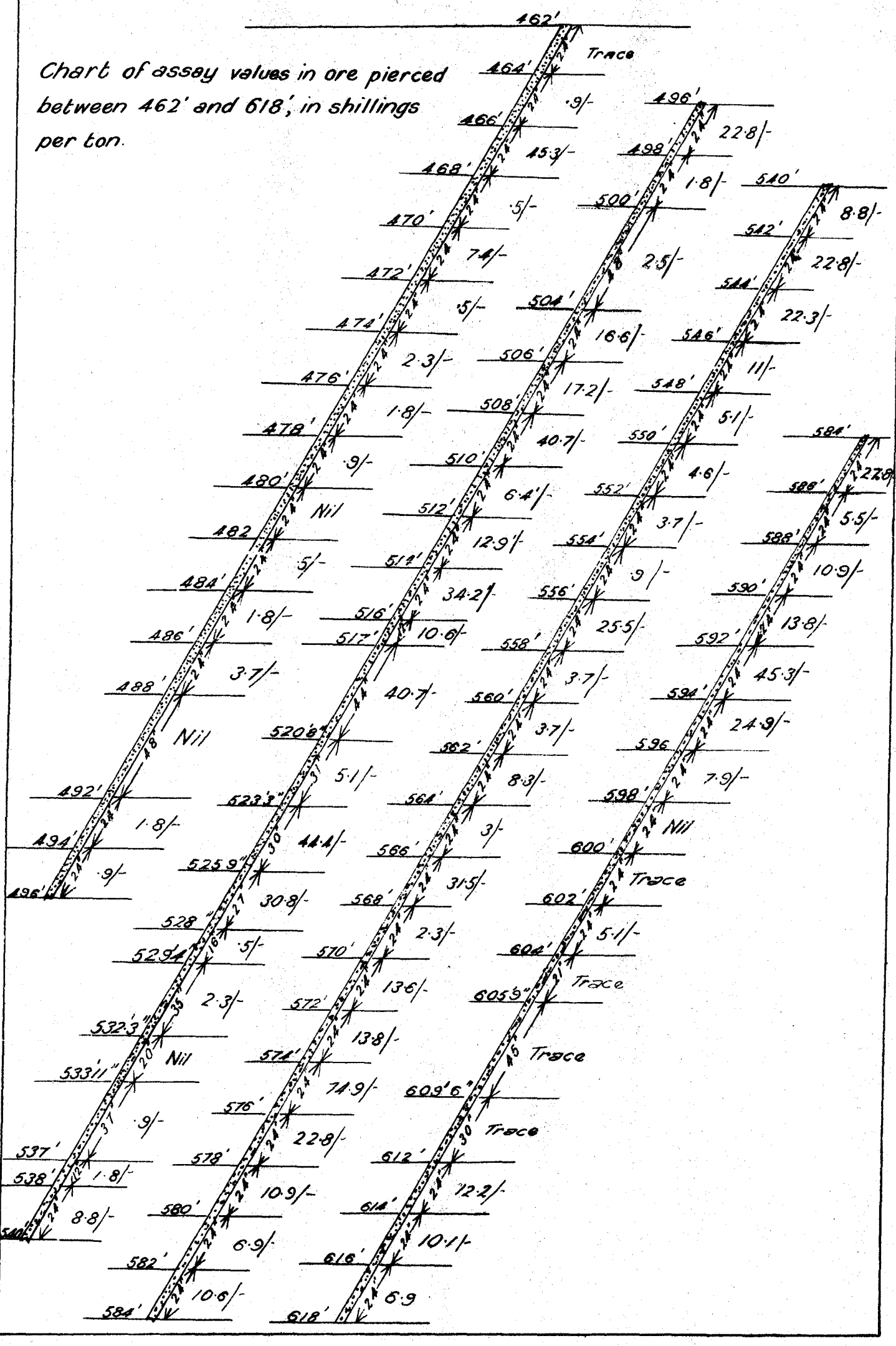
The figures in brackets indicate the length of core recovered from the corresponding section of boring

—N° 7 Bore—

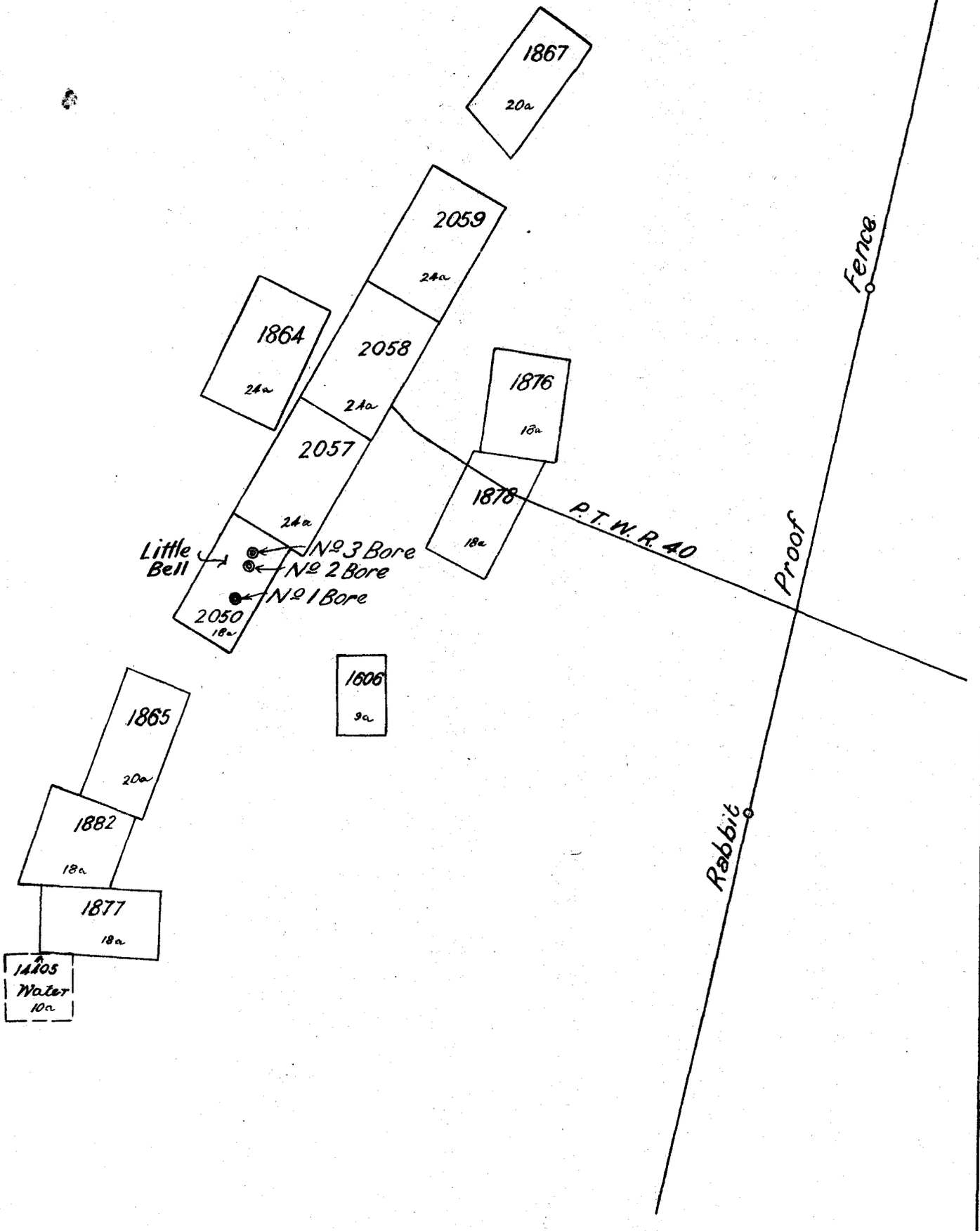
— BIG BELL G. M.—

—Scale: 4 Ft. - 1 In.—

Chart of assay values in ore pierced between 462' and 618', in shillings per ton.



Locality Plan
of Bores at
LITTLE BELL
COODARDIE
— Scale:- 20 Chs. to an In. —



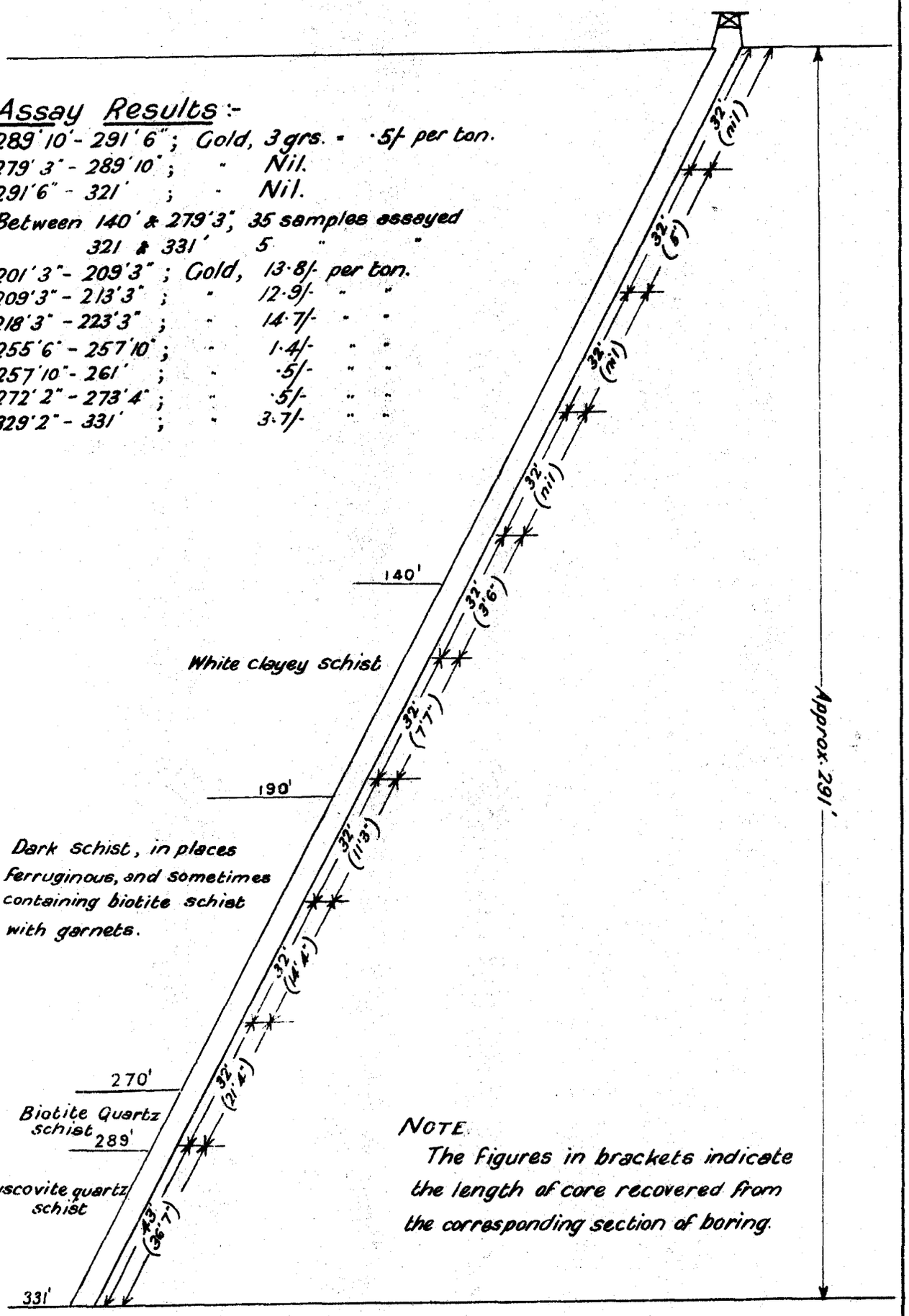
— Section N°1 Bore —
— LITTLE BELL G.M. —
— CUE —
— Scale:- 32 Ft. - 1 In. —

Depressed at an angle of 60°

Commenced 11. 9. 29.
Completed 23. 9. 29

Assay Results:-

289'10" - 291'6"; Gold, 3 grs. = ·5/- per ton.
279'3" - 289'10"; " Nil.
291'6" - 321'; " Nil.
Between 140' & 279'3", 35 samples assayed
321 & 331' 5 " "
201'3" - 209'3"; Gold, 13·8/- per ton.
209'3" - 213'3"; " 12·9/- " "
218'3" - 223'3"; " 14·7/- " "
255'6" - 257'10"; " 1·4/- " "
257'10" - 261'; " ·5/- " "
272'2" - 273'4"; " ·5/- " "
329'2" - 331'; " 3·7/- " "



NOTE.
The figures in brackets indicate the length of core recovered from the corresponding section of boring.

—Section No 2 Bore—

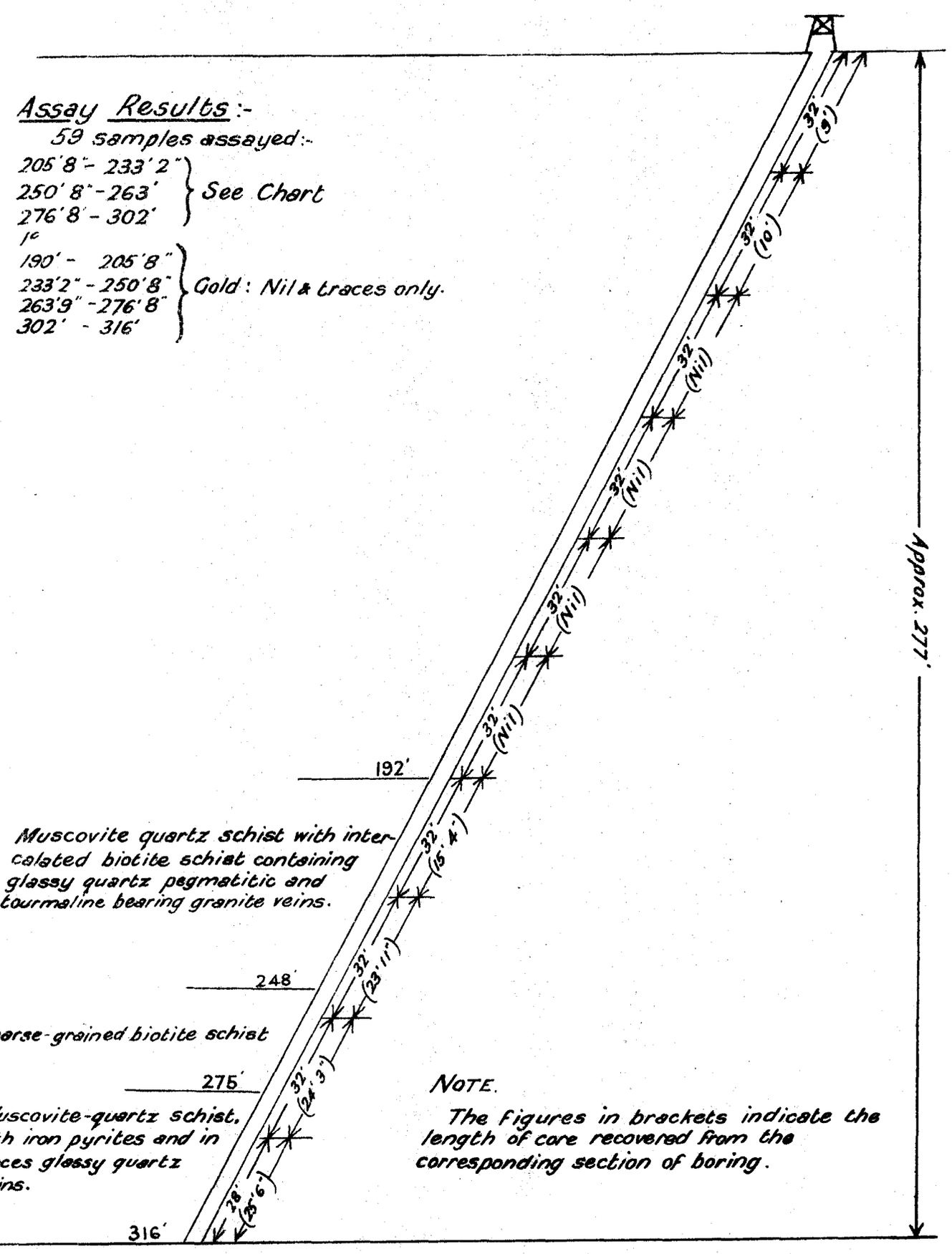
— LITTLE BELL G.M.L.—

— CUE —

— Scale:-32 Ft.-1 In.—

Depressed at an angle of 60°

Commenced 30. 9. 29.
Completed 10. 10. 29.



NOTE.

The figures in brackets indicate the length of core recovered from the corresponding section of boring.

— Nº 2 Bore —

— LITTLE BELL G.M.L. —

— CUE —

— Scale :- 4 Ft. = 1 In. —

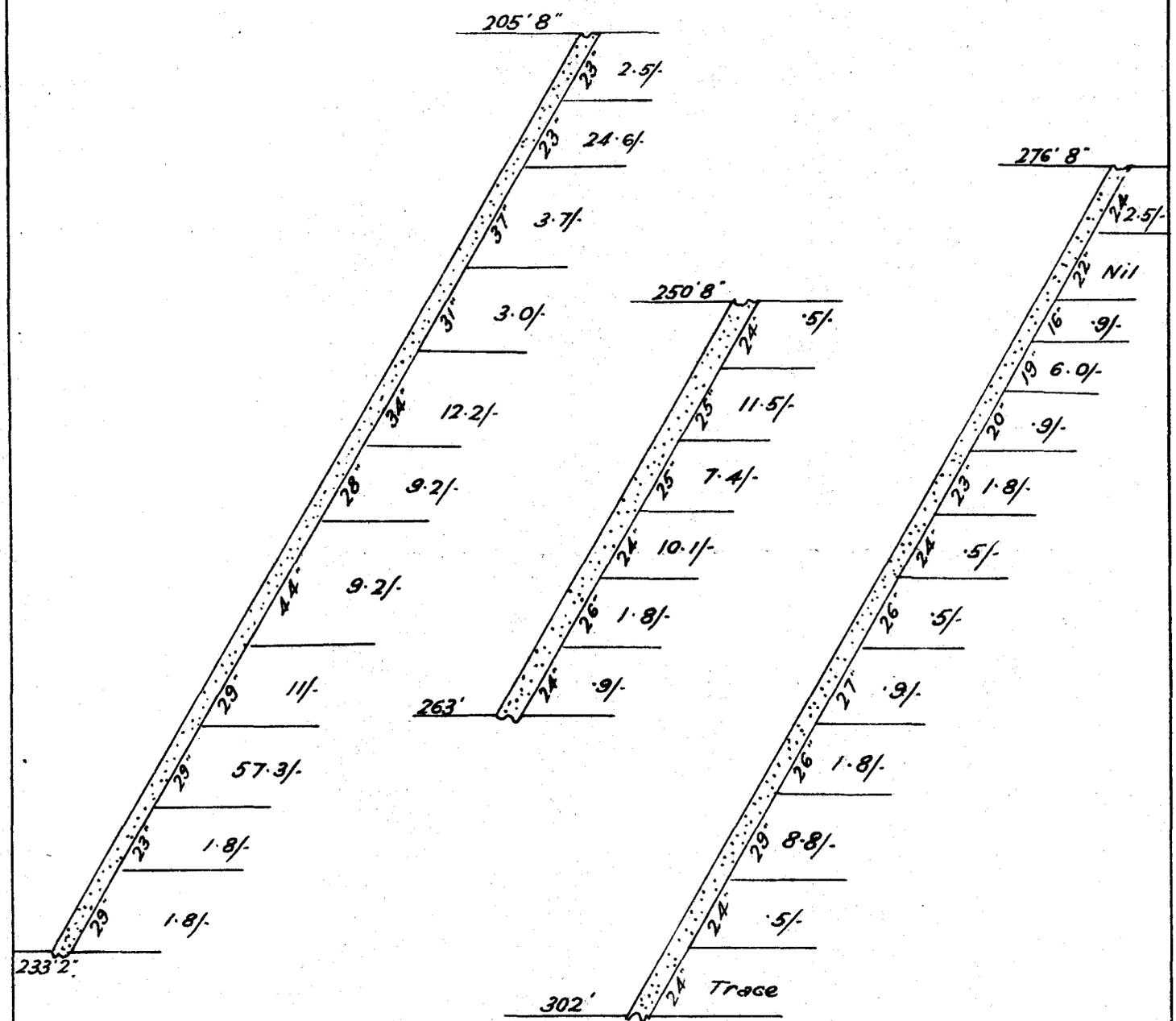


Chart of values in ore pierced between 205'8" & 302', in shillings per ton.

— Section N°3 Bore —

— LITTLE BELL G. M.L. —

— CUE —

— Scale :- 40 Ft. - 1 In. —

Depressed at an angle of 60°

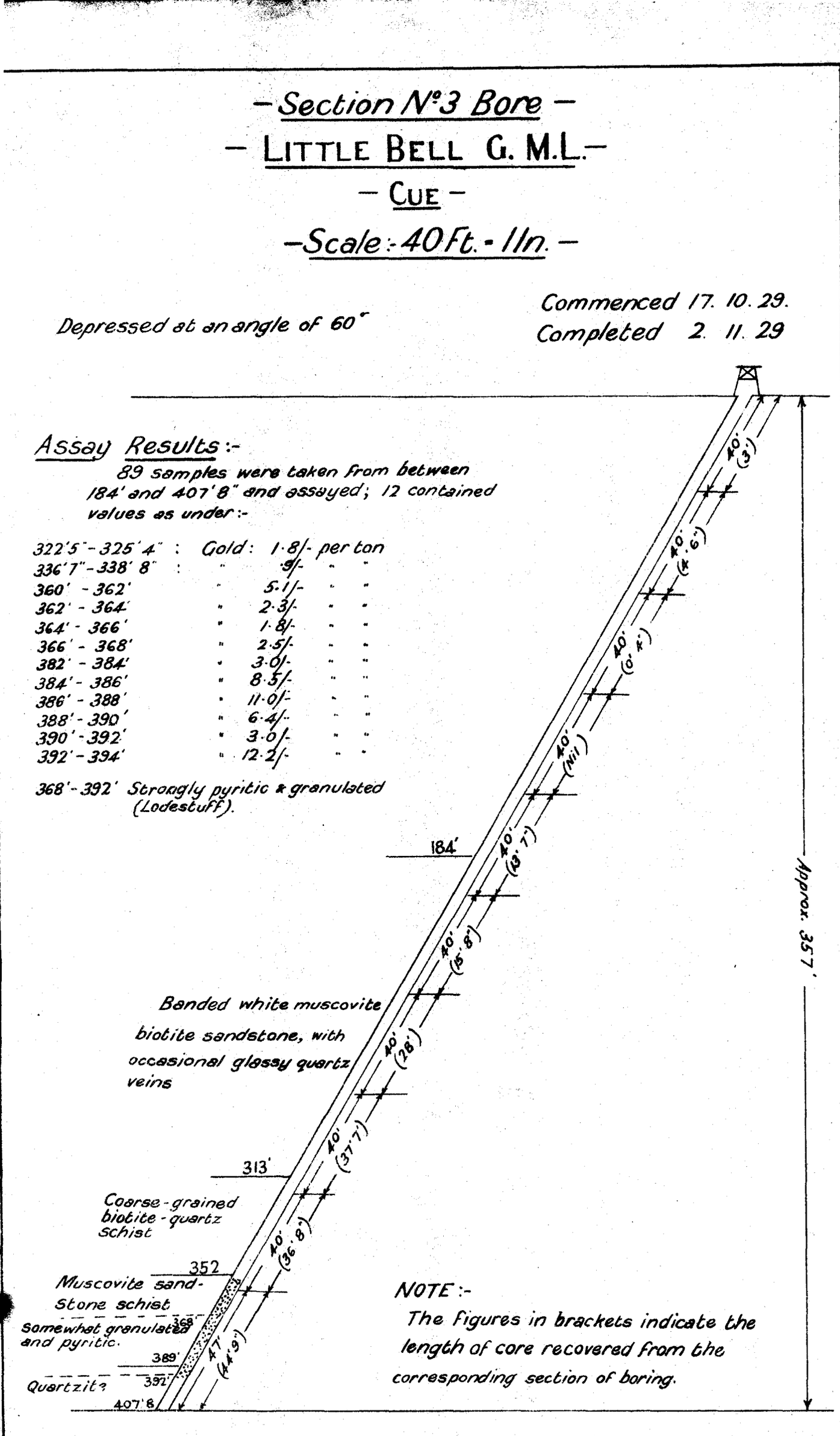
Commenced 17. 10. 29.
Completed 2. 11. 29

Assay Results :-

89 samples were taken from between 184' and 407'8" and assayed; 12 contained values as under :-

322'5" - 325'4"	: Gold :	1·8/-	per ton
336'7" - 338'8"	: "	9/-	" "
360' - 362'	"	5·1/-	" "
362' - 364'	"	2·3/-	" "
364' - 366'	"	1·8/-	" "
366' - 368'	"	2·5/-	" "
382' - 384'	"	3·0/-	" "
384' - 386'	"	8·5/-	" "
386' - 388'	"	11·0/-	" "
388' - 390'	"	6·4/-	" "
390' - 392'	"	3·0/-	" "
392' - 394'	"	12·2/-	" "

368' - 392' Strongly pyritic & granulated (Lodestuff).



NOTE :-
The figures in brackets indicate the length of core recovered from the corresponding section of boring.

-Section N° 1 Bore -

- NORSEMAN -

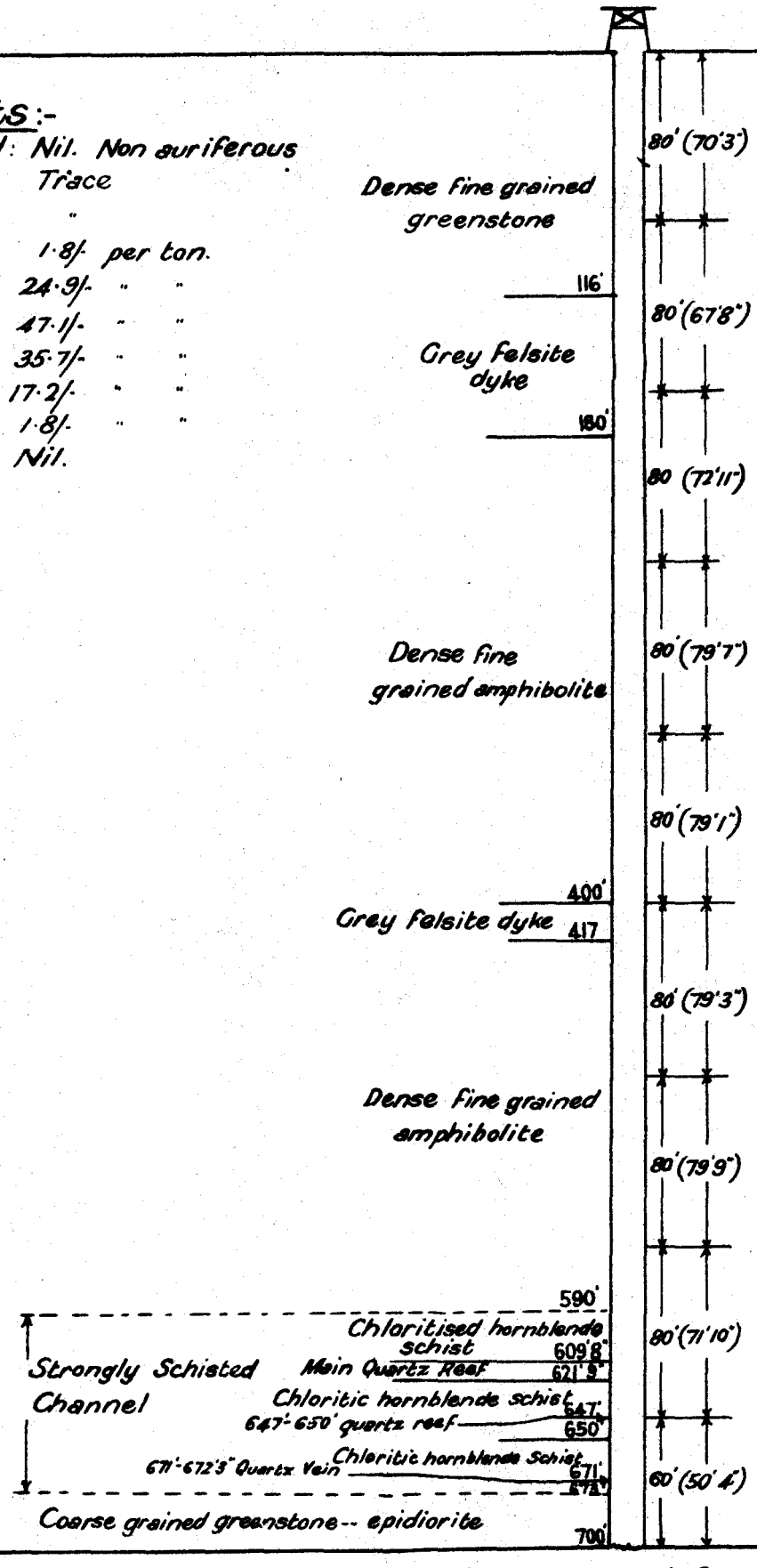
-Scale :- 80 Ft - 1 In -

Vertical

Commenced 24. 4. 29.
Completed 29. 7. 29.

Assay Results :-

400' - 417	Gold:	Nil. Non auriferous
609'8" - 610'4"	"	Trace
610'4" - 612'2"	"	"
612'2" - 613'8"	"	1·8/- per ton.
613'8" - 616'2"	"	24·9/- " "
616'2" - 618'9"	"	47·1/- " "
618'9" - 620'	"	35·7/- " "
620' - 621'9"	"	17·2/- " "
647' - 650'	"	1·8/- " "
671' - 672'3"	"	Nil.



NOTE :- The figures in brackets indicate the length of core recovered from the corresponding section of boring.

— Section No 2 Bore —

— MARAROA G.M.L. —

— NORSEMAN —

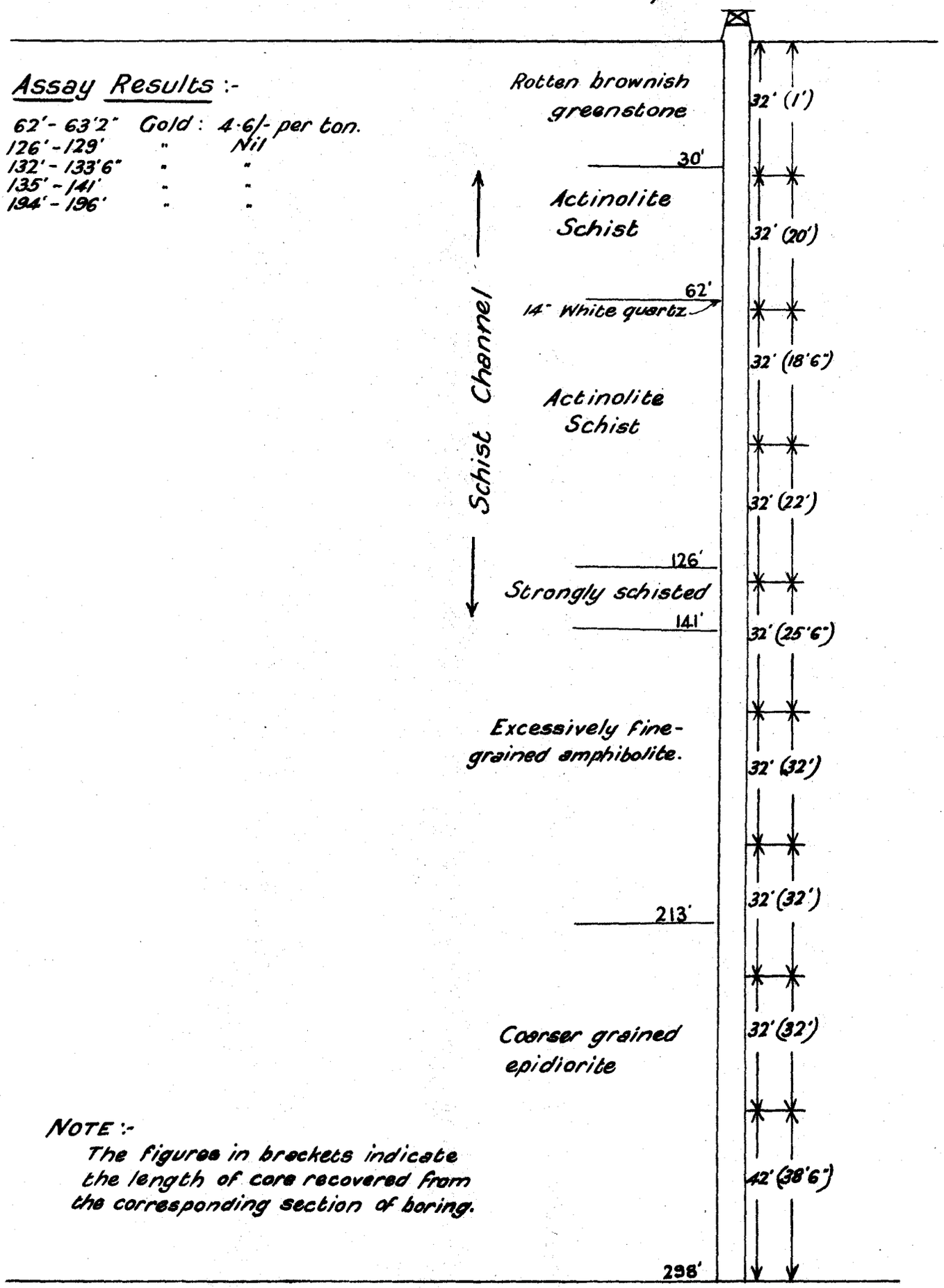
— Scale :- 32 Ft. = 1 In. —

Commenced 6. 8. 29.
Completed 27. 8. 29.

Vertical

Assay Results :-

62'- 63'2" Gold : 4·6/- per ton.
126'-129' " Nil
132'-133'6" " "
135'-141' " "
194'-196' " "



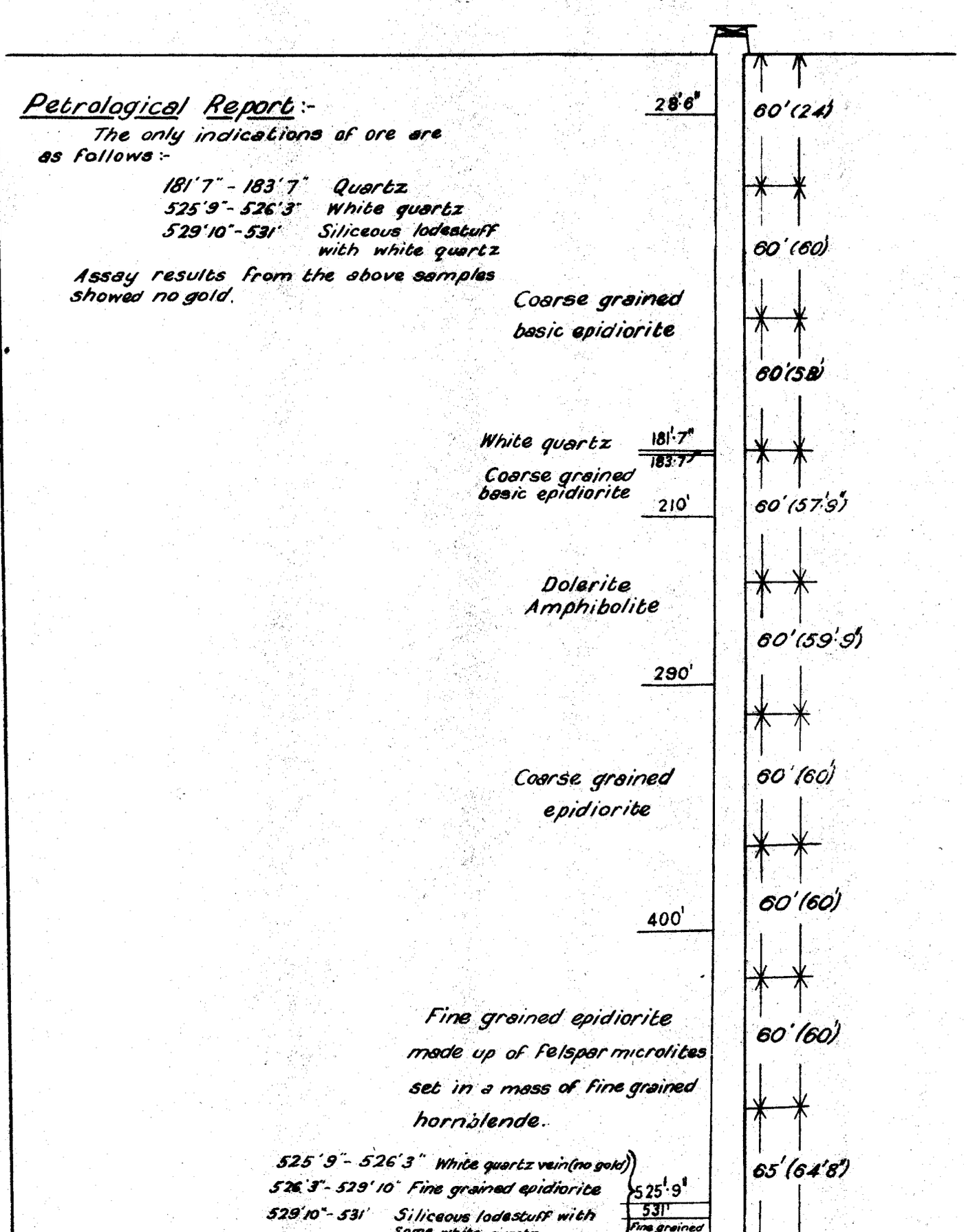
NOTE :-
The figures in brackets indicate the length of core recovered from the corresponding section of boring.

—Section No 3 Bore—
—VIKING G.M.L.—
—NORSEMAN—
—Scale:- 60 Ft. = 1 In.—

Commenced 4. 9. 29.

Completed 22. 11. 29.

Vertical.



Petrological Report:-

The only indications of ore are as follows:-

181'7" - 183'7" Quartz
525'9" - 526'3" White quartz
529'10" - 531' Siliceous lodestuff with white quartz

Assay results from the above samples showed no gold.

Coarse grained basic epidiorite

White quartz

Coarse grained basic epidiorite

Dolerite Amphibolite

Coarse grained epidiorite

Fine grained epidiorite made up of felspar microlites set in a mass of fine grained hornblende.

525'9" - 526'3" White quartz vein (no gold)
526'3" - 529'10" Fine grained epidiorite
529'10" - 531' Siliceous lodestuff with some white quartz

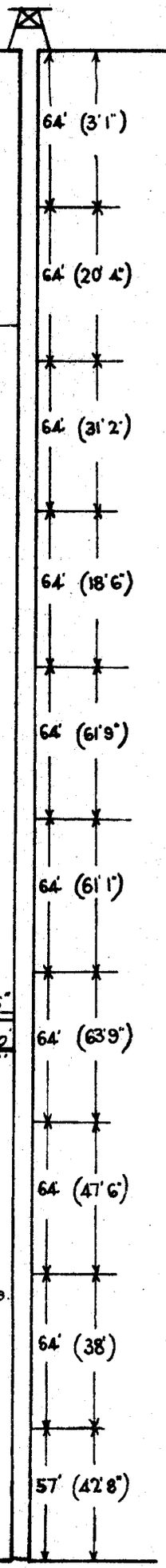
Fine grained epidiorite

NOTE:- The figures in brackets indicate the length of core recovered from the corresponding section of boring.

- Section of Bore -
— CARBINE G.M. —
— CARBINE —
— Scale 64 Ft. - 1 In. —

Vertical.

Commenced 13. 3. 29.
Completed 23. 5. 29.



Oxidized Zone

Greenstone derived from very basic rocks.

Quartzose material mixed with greenstone 433'6"-438' & 450'-453'

Greenstone derived from very basic rocks.

Extract from Petrologist's report:-

"The greenstone ranged from a fine grained chloritic actinolitic rock through almost pure chloritic rocks to chloritic carbonate schists

A feature was the numerous pseudo-phenocrysts of biotite & hornblende in the chlorite-carbonate rocks"

Apart from the quartzose material, between 433'6"-438' & 450'-453', the remainder of the core contained no metallic mineralization or other evidence of lode or reef formation.

Assays:-

433'6"-438' : Gold & Silver - nil.
450'-453' : Gold & Silver - nil.

Section of Bore

PROPHECY G.M.L.

BAMBOO CREEK

50 0 50 100

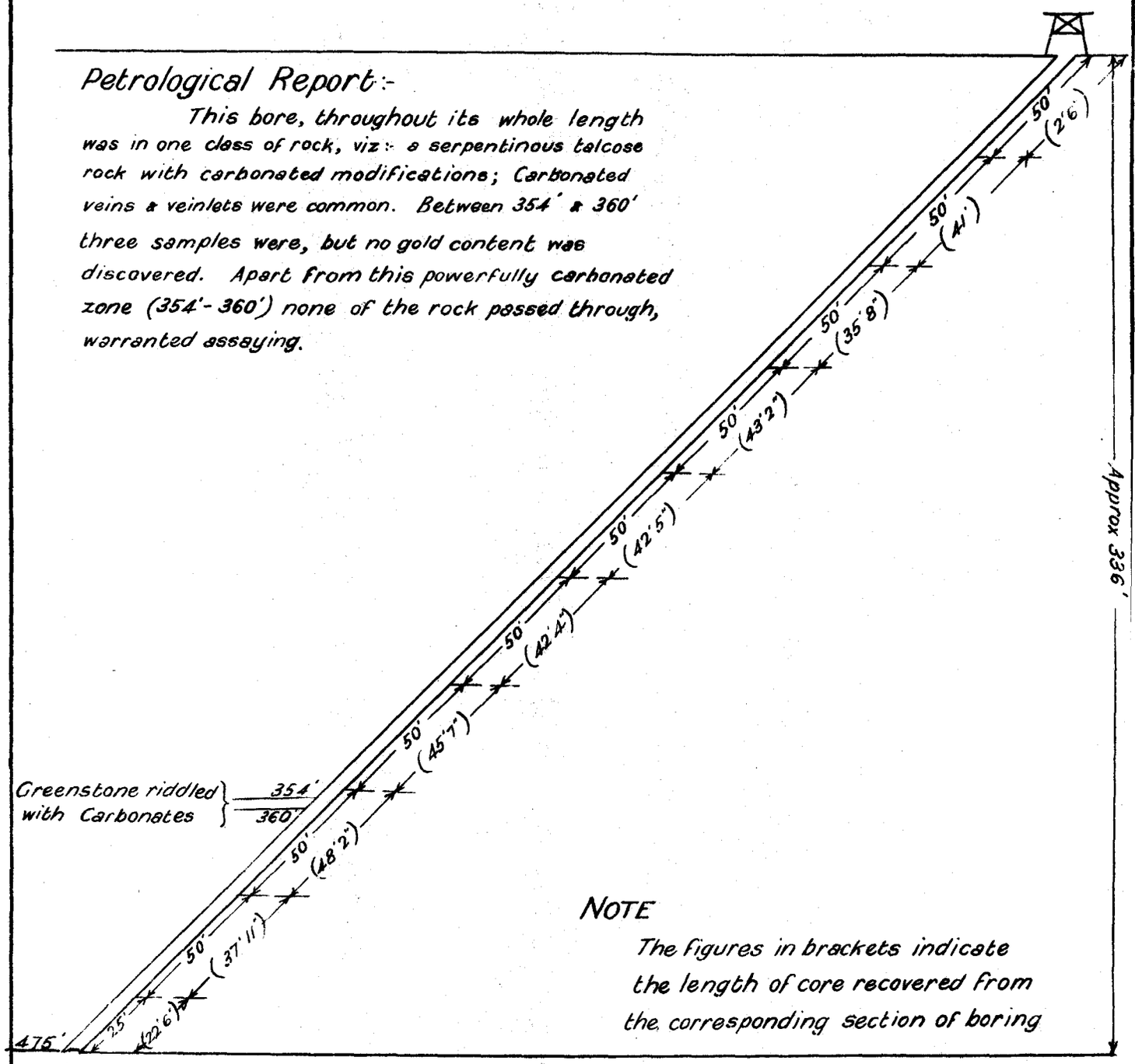
—Scale of Feet—

Depressed at an angle of 45°

Commenced 22. 4. 29.
Completed 18. 5. 29.

Petrological Report:-

This bore, throughout its whole length was in one class of rock, viz:- a serpentinous talcose rock with carbonated modifications; Carbonated veins & veinlets were common. Between 354' & 360' three samples were, but no gold content was discovered. Apart from this powerfully carbonated zone (354'-360') none of the rock passed through, warranted assaying.



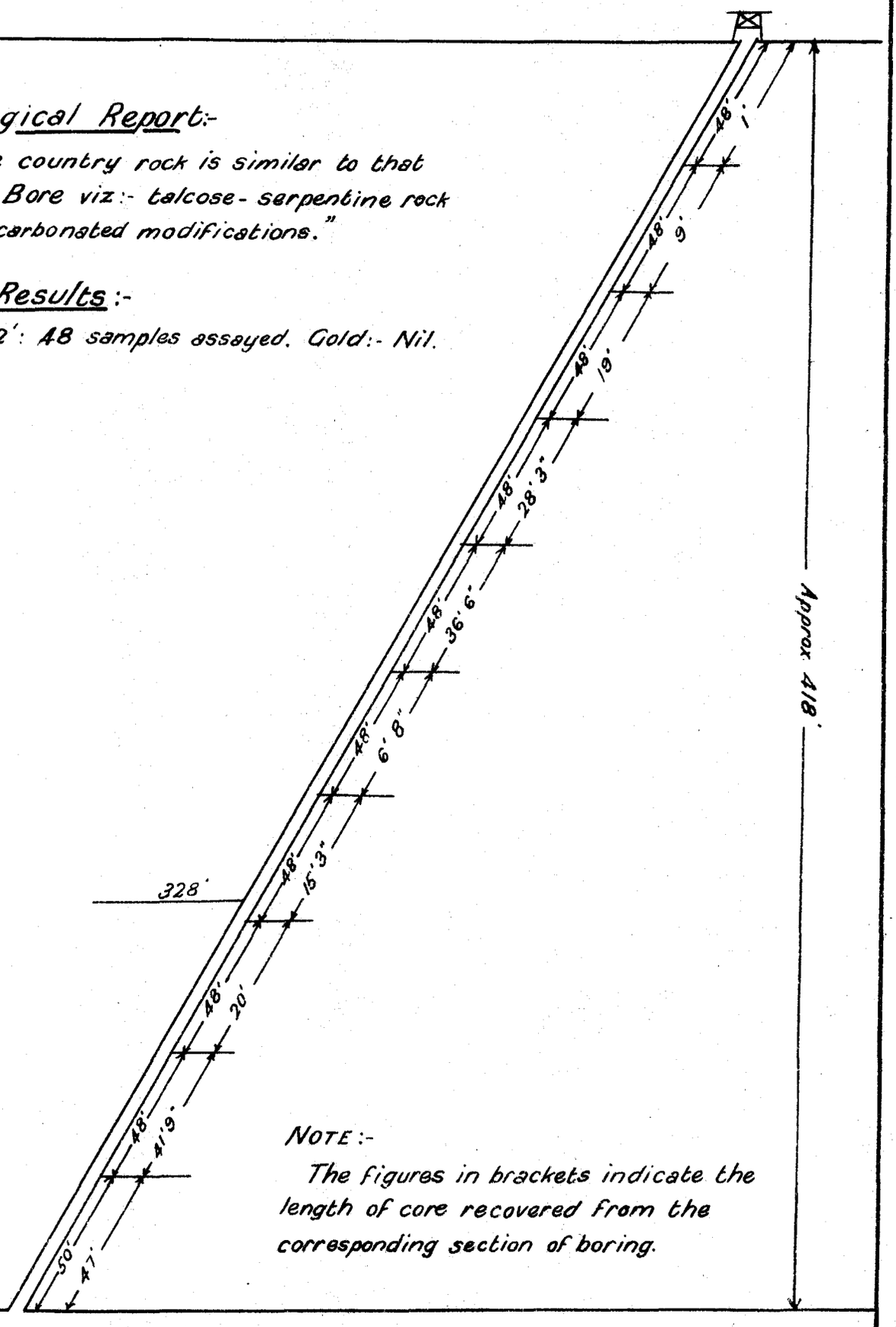
NOTE

The figures in brackets indicate the length of core recovered from the corresponding section of boring

- Section N°1 Bore -
- KITCHENER G.M.L. -
- BAMBOO CREEK -
- Scale:- 48ft. = 1In. -

Depressed at an angle of 60°

Commenced 15. 3. 29
Completed 11. 4. 29



Petrological Report:-

"The country rock is similar to that in N° 2 Bore viz:- talcose-serpentine rock with its carbonated modifications."

Assay Results:-

328'- 342': 48 samples assayed. Gold:- Nil.

NOTE:-

The figures in brackets indicate the length of core recovered from the corresponding section of boring.

—Section Nº 2 Bore—

— KITCHENER G.M.L.—

— BAMBOO CREEK —

— Scale :- 48 ft. = 1 In. —

Depressed at an angle of 60°

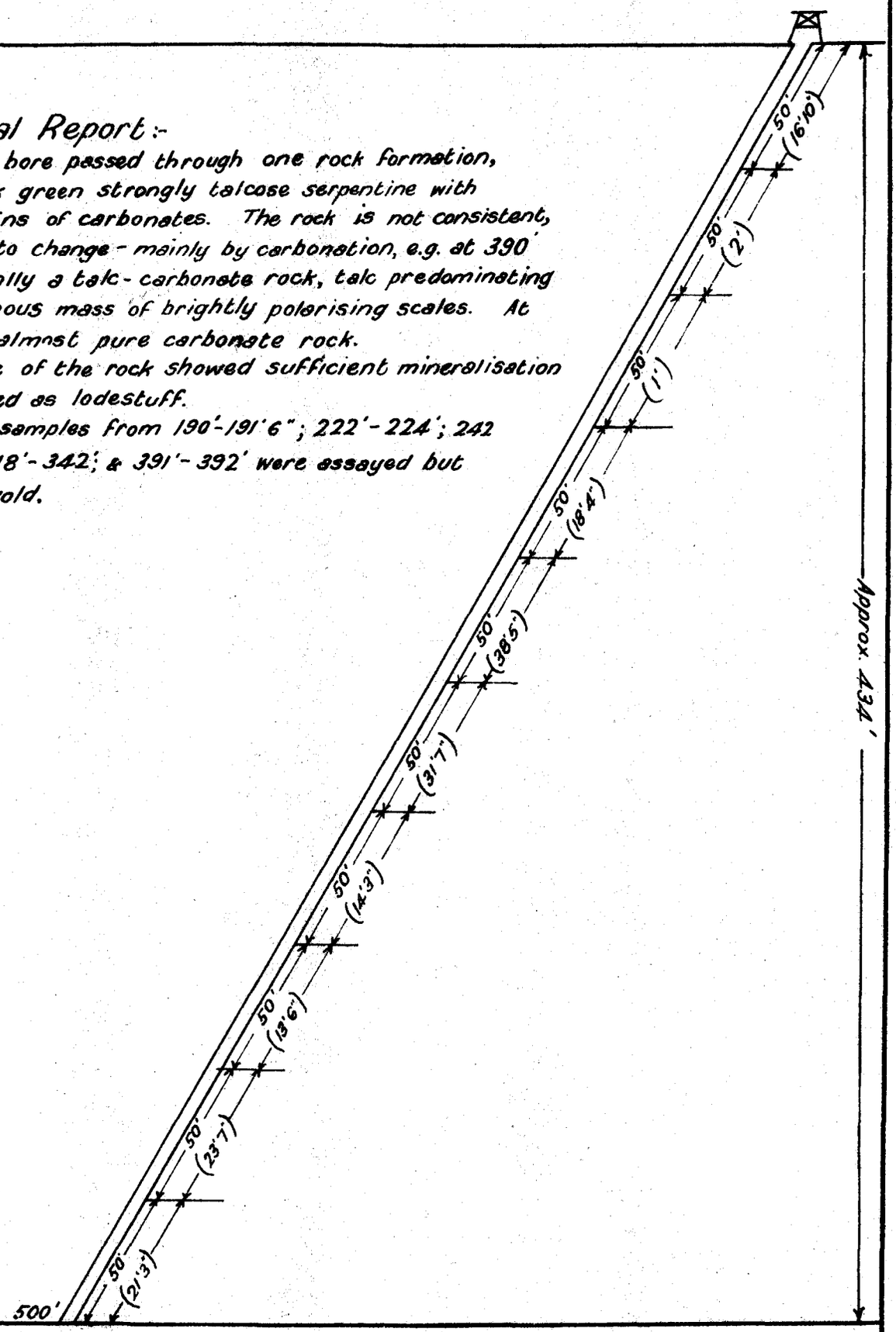
Commenced 21. 3. 29
Completed 25. 4. 29

Petrological Report :-

This bore passed through one rock formation, chiefly a dark green strongly talcose serpentine with scattered grains of carbonates. The rock is not consistent, but is liable to change - mainly by carbonation, e.g. at 390' it is essentially a talc - carbonate rock, talc predominating in a hetrogenous mass of brightly polarising scales. At 210' it is an almost pure carbonate rock.

None of the rock showed sufficient mineralisation to be regarded as lodestuff.

Five samples from 190'-191'6"; 222'-224'; 242 242'-243'; 318'-342'; & 391'-392' were assayed but yielded no gold.

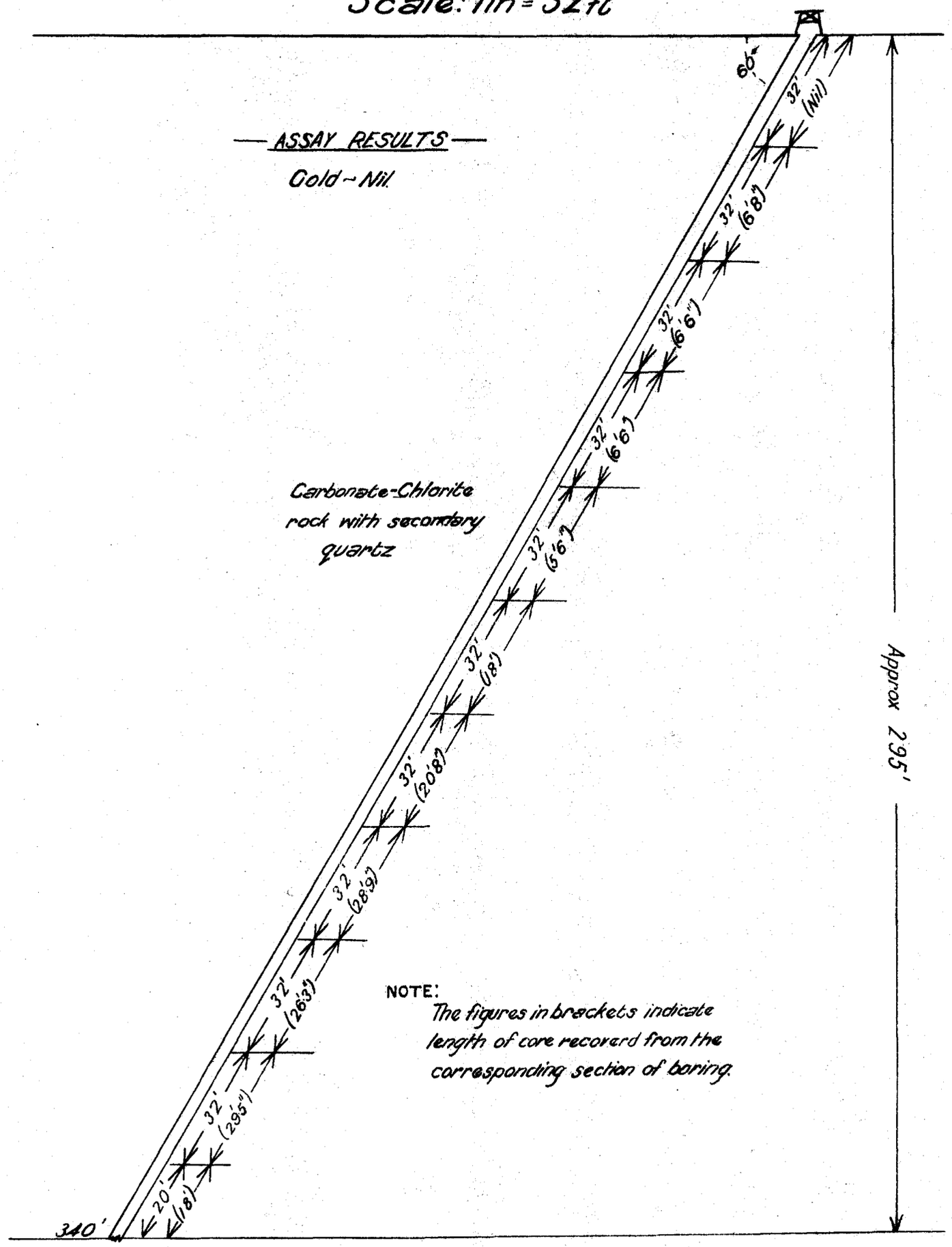


Section of Bore

BONNIE DOON G.M.

Bamboo Creek

Scale: 1in = 32ft



ASSAY RESULTS

Gold - Nil

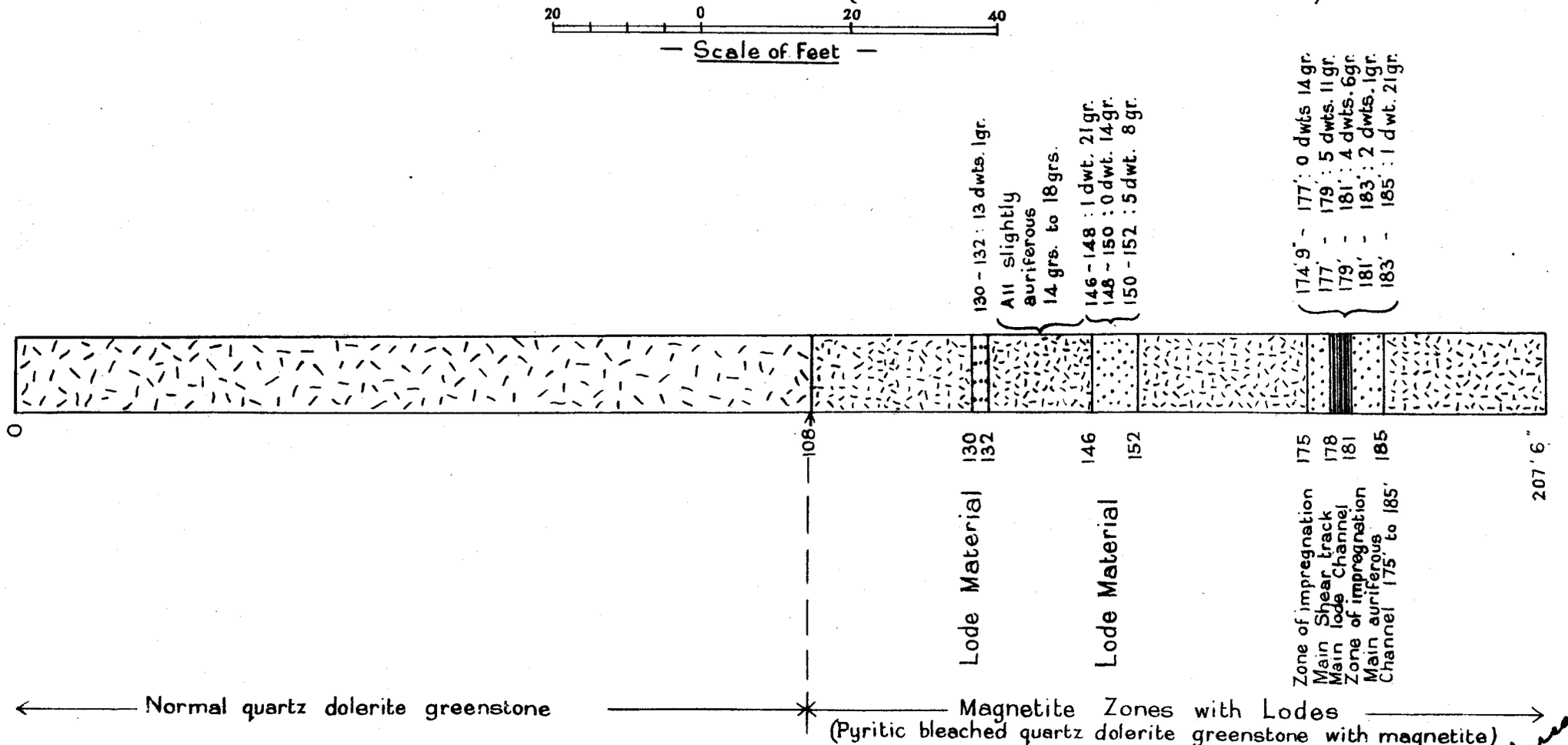
Carbonate-Chlorite rock with secondary quartz

NOTE:
The figures in brackets indicate length of core recovered from the corresponding section of boring.

ENTERPRISE GOLD MINE, KALGOORLIE

Geological Section through Nº 4 Horizontal Bore

from 773 ft level, Hainault G.M. (752 ft. v.d. Enterprise G.M.).

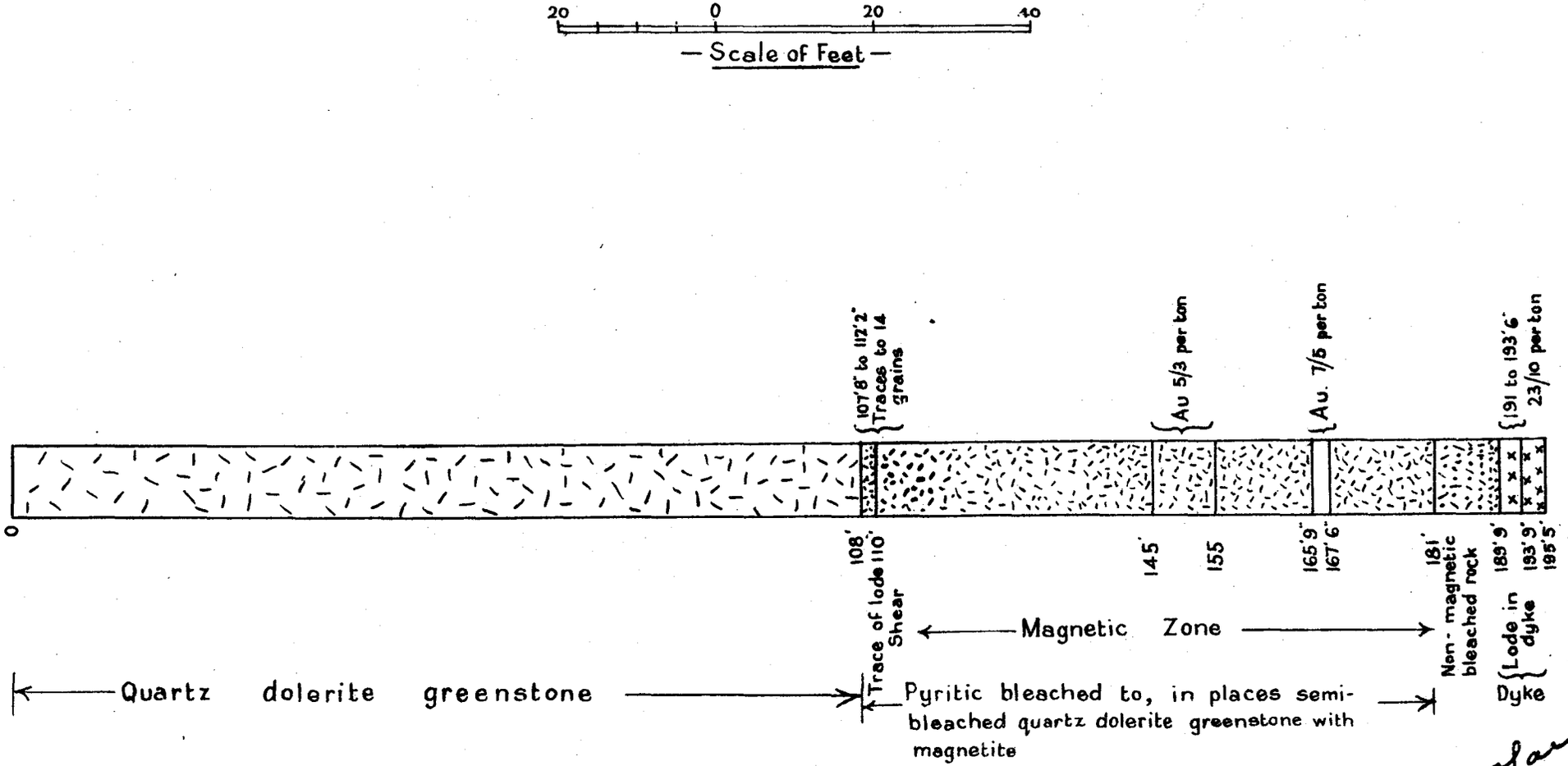


- FIGURE I -

ENTERPRISE GOLD MINE, KALGOORLIE

Geological Section through Nº 5 Horizontal Bore

from 773 ft. level, Hainault G.M. (752 ft. v.d. Enterprise G.M.)



— FIGURE II —

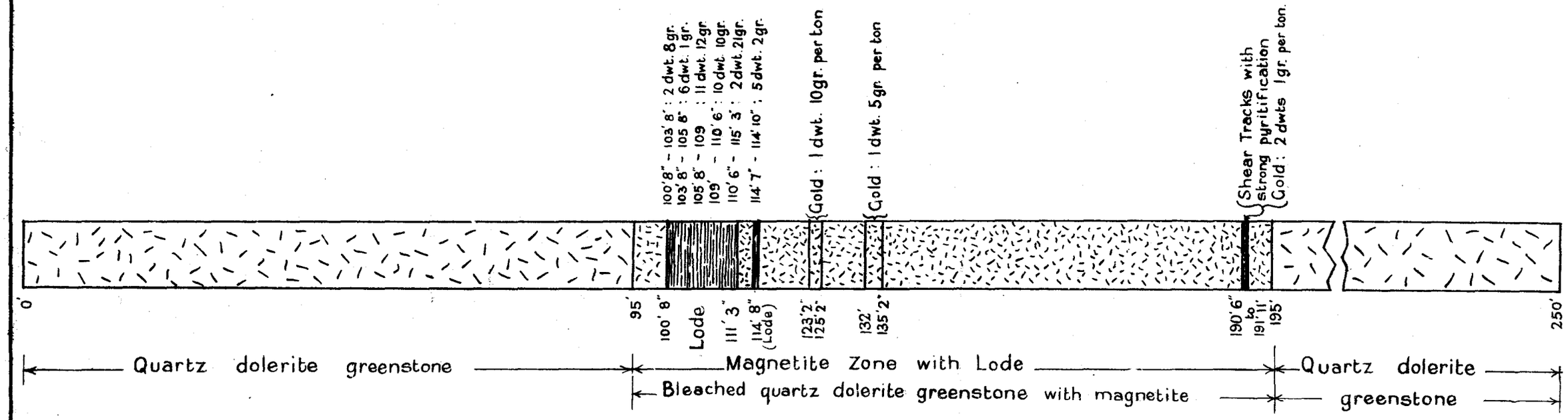
ENTERPRISE GOLD MINE, KALGOORLIE

Geological Section through Nº 6 Horizontal Bore

from 773 ft. level, Hainault G. M. (752 ft. v.d. Enterprise G.M.)

20 0 20 40

— Scale of Feet —



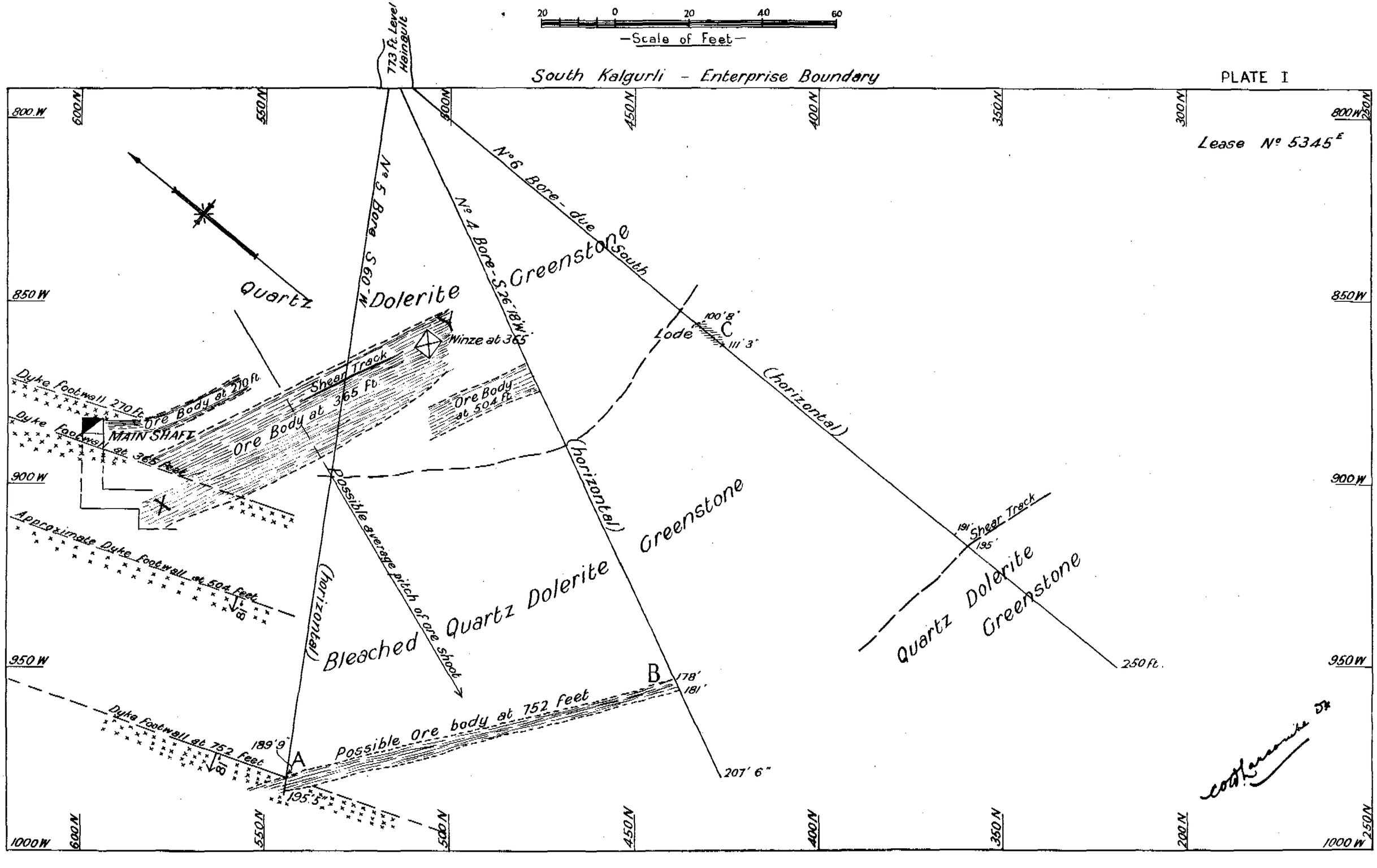
— FIGURE III —

C.O.G. Jnr.

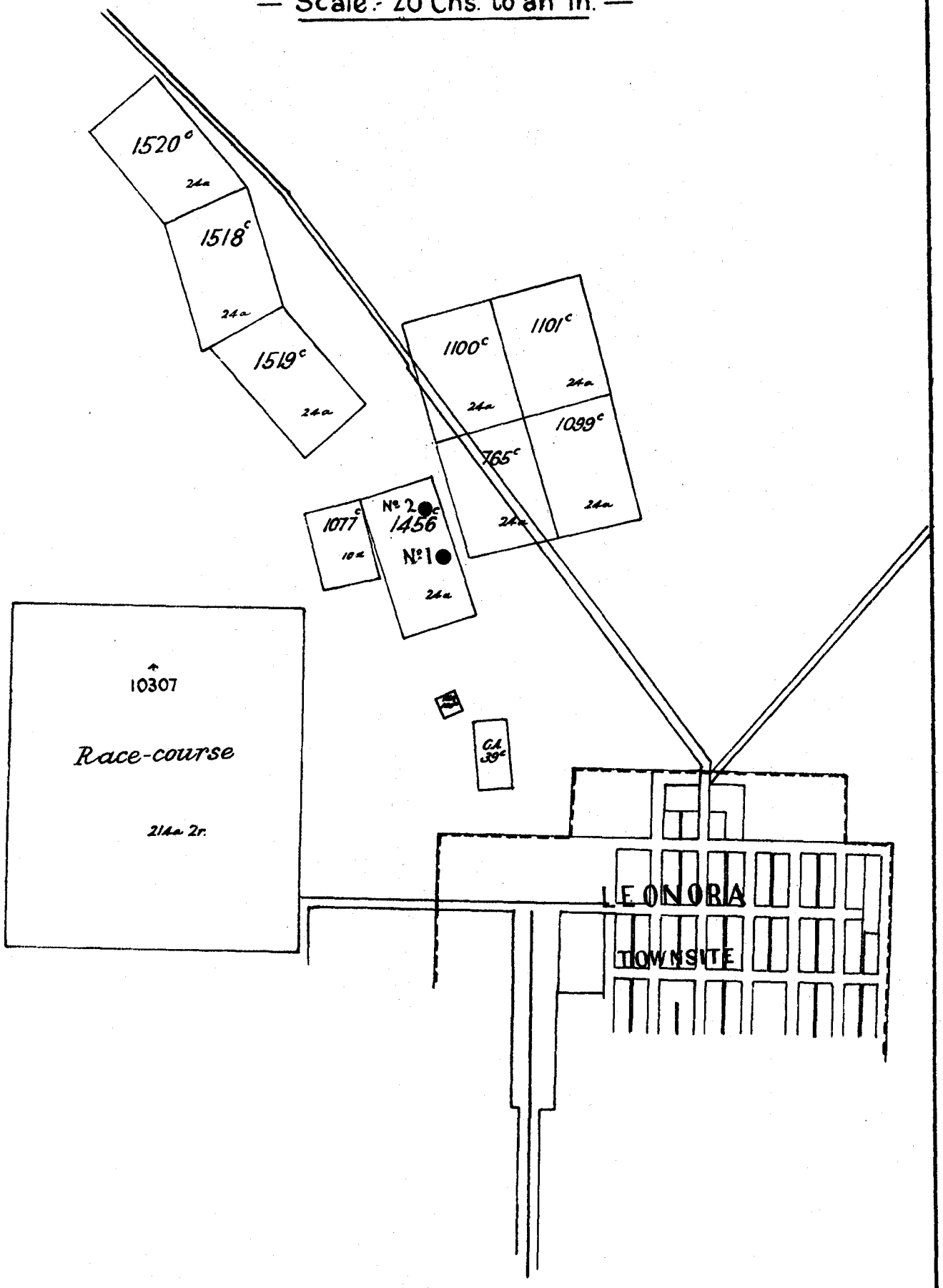
Geological Plan

ENTERPRISE GOLD MINE

Shewing three bores at 752 Ft. Level with position of dyke and ore bodies at different levels



Locality Plan
of Bores at
HARBOUR LIGHTS
LEONORA
— Scale:- 20 Chs. to an In. —



– Section N°2 Bore –

–HARBOUR LIGHTS G.M.L.–

– LEONORA –

– Scale:-50 Ft.= 1In. –

Commenced 8. 12. 28

Depressed at an angle of 60°

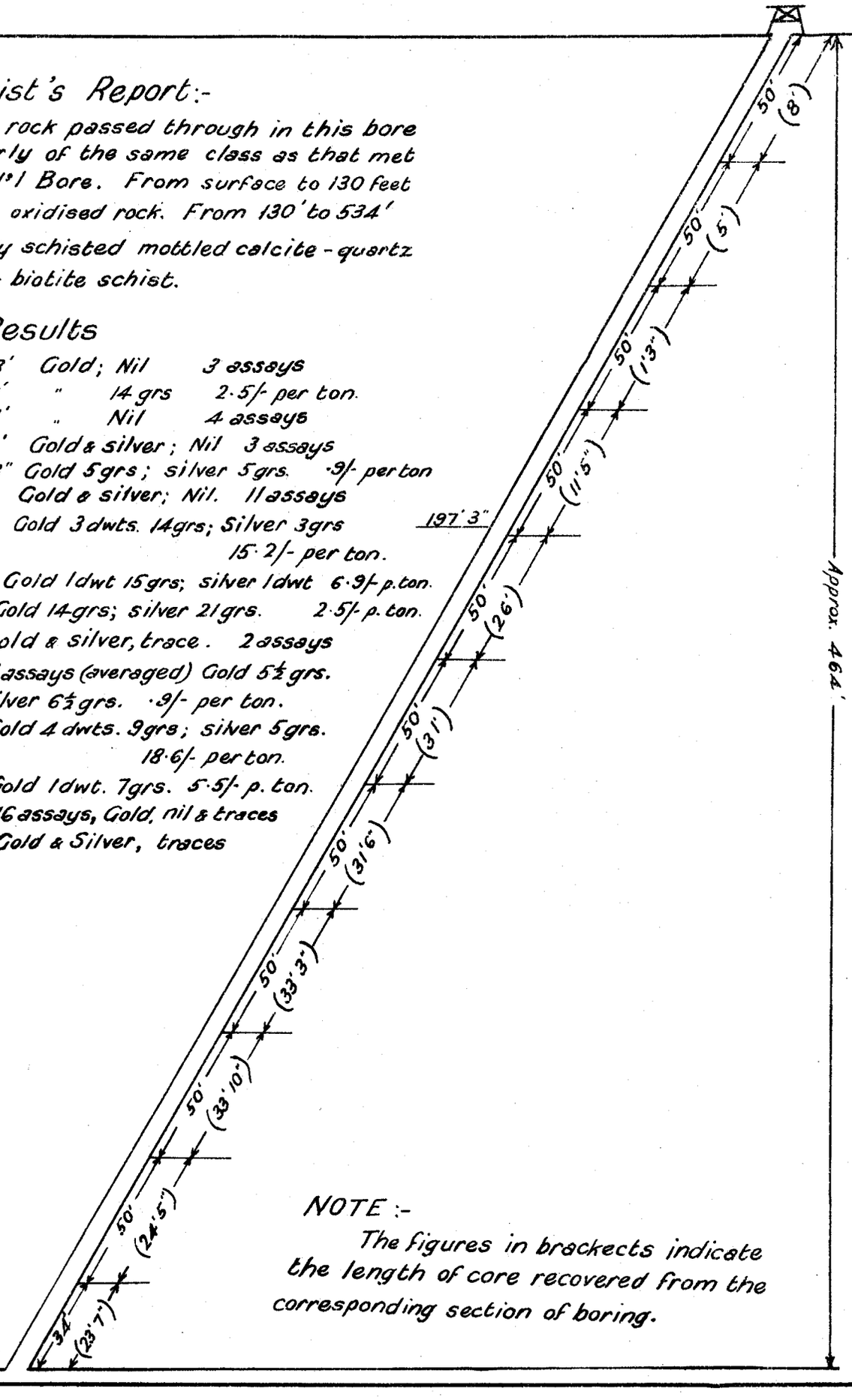
Completed 4. 2. 29

Petrologist's Report:-

The rock passed through in this bore was clearly of the same class as that met with in N°1 Bore. From surface to 130 feet was brown oxidised rock. From 130' to 534' powerfully schisted mottled calcite - quartz - chlorite - biotite schist.

Assay Results

197'3" - 218' Gold; Nil 3 assays
218' - 228' " 14 grs 2·5/- per ton.
228' - 267' " Nil 4 assays
267' - 280' Gold & silver; Nil 3 assays
280' - 285'3" Gold 5grs; silver 5grs. ·9/- per ton
285'3" - 355' Gold & silver; Nil. 11 assays
355' - 359' Gold 3 dwts. 14grs; Silver 3grs 15·2/- per ton.
359' - 364' Gold 1dwt 15grs; silver 1dwt 6·9/- p. ton.
364' - 370' Gold 14grs; silver 21grs. 2·5/- p. ton.
370' - 390' Gold & silver, trace. 2 assays
390' - 416' 5 assays (averaged) Gold 5½ grs. Silver 6½ grs. ·9/- per ton.
416 - 423' Gold 4 dwts. 9grs; silver 5grs.
423' - 426' 18·6/- per ton.
423 - 426' Gold 1dwt. 7grs. 5·5/- p. ton.
426' - 511'10" - 16 assays, Gold, nil & traces
511'10" - 534' Gold & Silver, traces



NOTE :-

The figures in brackects indicate the length of core recovered from the corresponding section of boring.

—Section N°9 Bore—

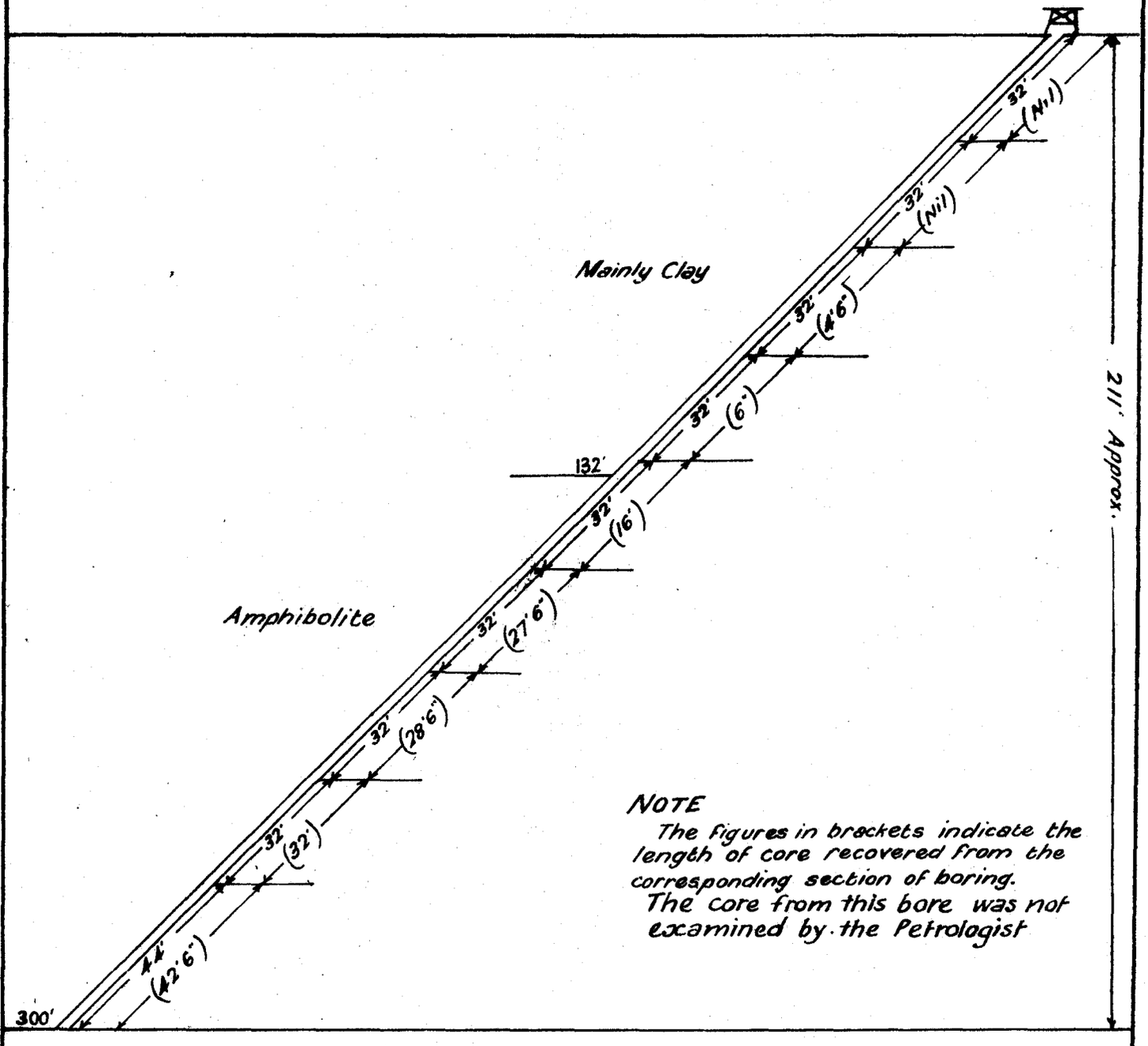
—KAPANGA LEASE—

— GREENBUSHES —

— Scale :- 32 Ft. = 1 In. —

Depressed at an angle of 45°

Commenced 16. 1. 29.
Completed 1. 2. 29.



NOTE

The figures in brackets indicate the length of core recovered from the corresponding section of boring.
The core from this bore was not examined by the Petrologist

— Section Nº 10 Bore —

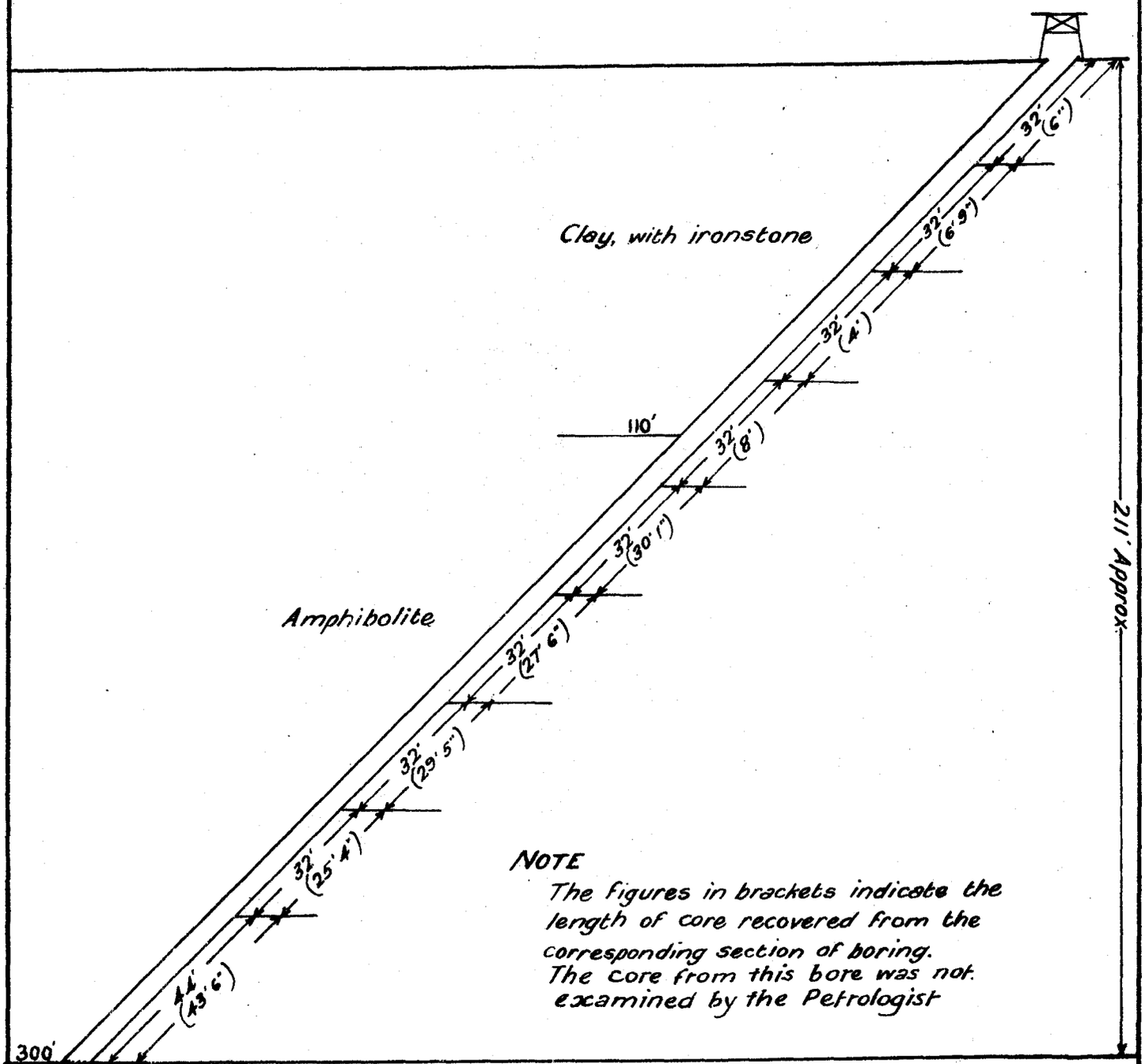
— KAPANGA LEASE —

— GREENBUSHES —

— Scale :- 32 Ft. = 1 In. —

Depressed at an angle of 45°

Commenced 8. 2. 29.
Completed 28. 2. 29.



NOTE

The figures in brackets indicate the length of core recovered from the corresponding section of boring. The core from this bore was not examined by the Petrologist

—Section N°11 Bore—

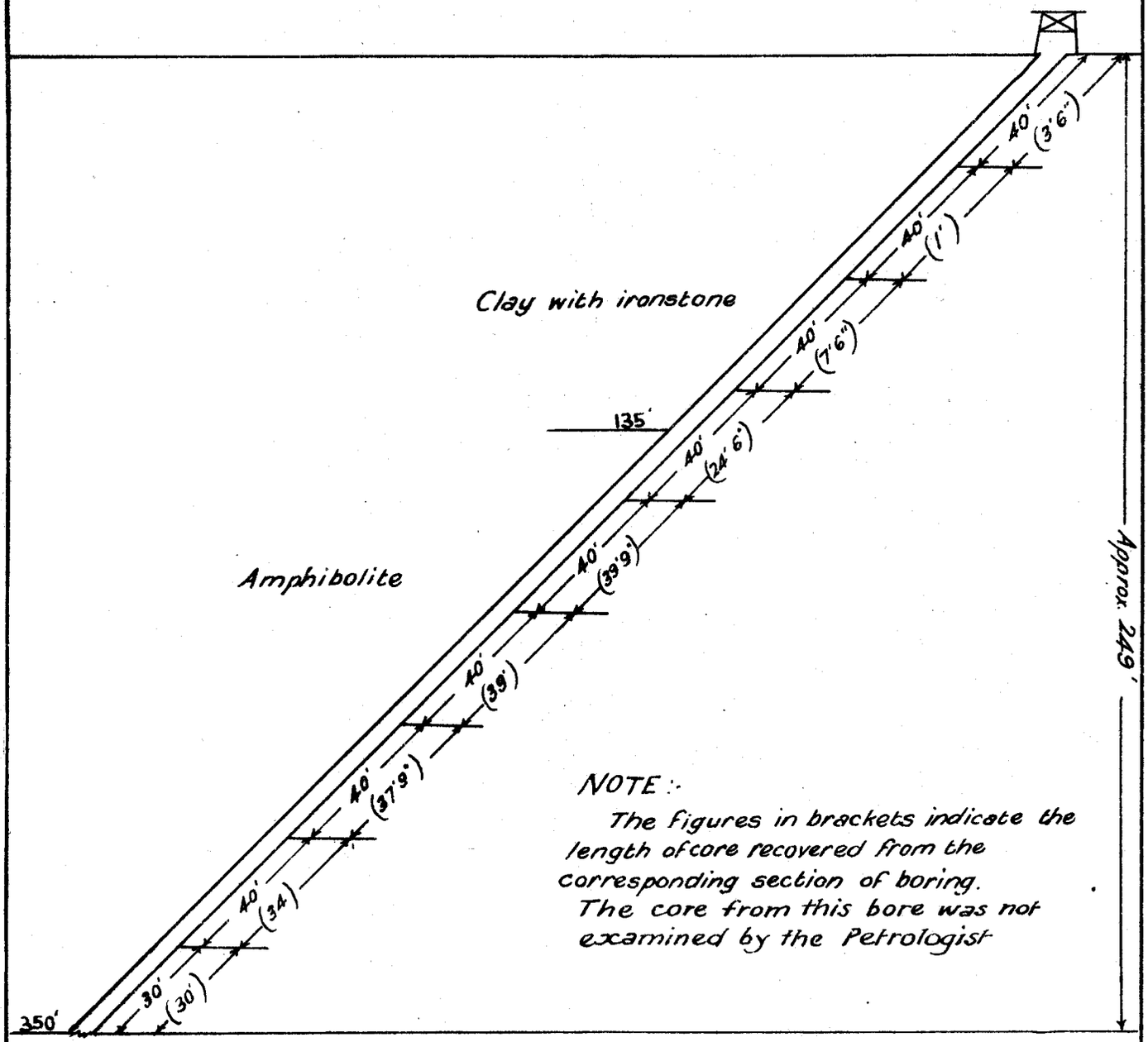
—KAPANGA LEASE—

— GREENBUSHES —

— Scale:- 40 Ft. = 1 In. —

Depressed at an angle of 45°

Commenced 8. 3. 29.
Completed 27. 3. 29.



NOTE:-
The figures in brackets indicate the length of core recovered from the corresponding section of boring.
The core from this bore was not examined by the Petrologist

DIVISION V.

ACTING DIRECTOR'S REPORT FOR THE YEAR 1929.

School of Mines,
Kalgoorlie, 30th January, 1930.

The Under Secretary for Mines, Mines Department, Perth.

I beg to forward for the information of the Honourable the Minister my Report on the work of the School for the year 1929.

At the end of January last, on the retirement from active duty of the late Director, Mr. F. B. Allen, M.A., B.Sc., I was appointed Acting-Director.

Mr. Allen was appointed Director of the W.A. School of Mines, which was then projected, about the middle of the year 1902. Pending the erection of suitable buildings on his designs at Kalgoorlie, which had superseded Coolgardie as the principal mining centre, actual teaching of School of Mines subjects commenced in November, 1902, in the old Exhibition Buildings, at Coolgardie, and was carried on there till the end of 1903, with a limited staff. Under his care, the original buildings, class accommodation and equipment at Kalgoorlie have been considerably extended from time to time, and the grade of instruction and its scope improved and its usefulness increased.

Being himself a School of Mines man, Mr. Allen had a thorough understanding of the needs of the School and the excellence of the foundations laid by him is shown by the present standing of the school and its students.

At the end of the year (1929), Mr. J. H. Tate, who had occupied the position of Lecturer in Mechanical Engineering in the School for nearly thirteen years, retired and has been succeeded by Mr. C. C. Meredyth, a former student of the School, who amongst other things has had ten years in responsible capacities on the fields and so brings to his teaching a considerable amount of practical knowledge.

Mr. Tate has been an earnest instructor and has devoted much time and energy to his work in the School, and the good positions held by many of the students who have passed through his hands form a measure of the excellence of his tuition.

The number of students entering the School for the year was one hundred and fifty, an increase of nearly forty per cent. over the previous year. A considerable portion of the increase was distributed over classes of more immediate usefulness, such as Fitting and Turning, Engine Driving and Gas Engine Classes, which often form a starting point for new entrants.

No doubt the more optimistic feeling induced by the favourable reports of examining geologists, and the late good developments south of the Golden Horseshoe Mine, along with the active policy pursued by the Lake View and Star, Ltd., have contributed to a greater faith in the mining situation and in local opportunities.

In this revival it is hoped the School of Mines will play an important part as better technical control in all departments of mining will undoubtedly be called for in the future.

I enclose a partial list of students—past and present—whose occupations are known. Amongst these, it is particularly pleasing to note the high position attained in this State by Mr. F. C. Edmondson, as General Manager of the Electricity and Gas Department of the Perth City Council. Generally, however, these past and present students continue to hold their positions with credit to both the School and themselves.

Classes have been held in all but two of the forty subjects of instruction in their different grades provided for by the syllabus, and the percentage of passes has been up to the average.

In all classes the work has been conducted in a capable manner by the various lecturers and the grade of instruction has been maintained. Assistance has also been given to various students who were preparing for University degree examinations in such subjects as mathematics (Mr. Illidge), Physics (Mr. McDougall), Geology (Dr. Larcombe), during the year.

In the Preparatory Classes, which are the regular feeders to the higher classes, the numbers have been maintained.

Mr. B. H. Moore, the Acting Assistant Director and Lecturer in Chemistry, etc., as supervising metallurgist, has taken a very active part in the work of the Metallurgical Laboratory, besides his work on public assays for prospectors, which involved 227 assays, and special assays for the detective staff of the Police Department.

In this connection, in his capacity of Curator of the School Museum, Dr. Larcombe has made 51 rock and mineral determinations.

In the Metallurgical Laboratory, the Experimental Metallurgist, Mr. W. G. Clarke, has been very fully occupied. A good deal of flotation test work, promising satisfactory results in practice was done for the Wiluna Gold Mines, Ltd., on samples of the antimonial gold bearing ore which occurs in some parts of their west lode, and on low grade ore from the Lake View and Star Mine. In the latter case, the management propose erecting a flotation unit with a capacity of about 5,000 tons per month.

Besides these, investigations were carried on for the Oriental Consolidated Gold Mines, Korea, on a sample from a heap of about 450,000 tons of accumulated pyritic sands, and on bore core samples from the Big Bell Mine, Murchison.

Investigations are now proceeding on a sample of cassiterite-tantalite concentrates from Greenbushes, and on a sample of stamp battery tailings, containing copper, from near Gabanintha, Murchison.

During the year there were made in connection with work in the Metallurgical Laboratory 1,115 gold and silver assays and 1,557 chemical determinations—a total of 2,672 tests.

The problems which come forward are often not by any means easy of solution and often involve much search in chemical and metallurgical literature, and call for much initiative.

The work done during 1929 will be incorporated in Bulletin No. 5 of the School.

There is great need of a small continuous flotation plant to enable runs of one ton or more to be made after a thorough investigation on the present scale. When installed it will be very largely automatic and will entail little attention.

On his retirement from the management of the Golden Horseshoe Mine the late general manager, Mr. J. W. Sutherland, presented the School with a considerable quantity of small-scale experimental plant which has been very much appreciated, and from time to time various portions of this donation have been brought into use.

I have to thank the different members of the Staff —both full-time and part-time instructors, and the Registrar—for their loyal support during the year. Each in his own sphere has given close attention to his work at all times. Upon those who had students who were proceeding to University degrees some extra work has devolved—a service performed now for some years and one which has been very useful to those wishing to take degree work involving science or mathematics. In the classes conducted by the part-time instructors, Fitting and Turning (Mr. Slee), Gas Engine (Mr. Bosustow), and Engine Driving (Mr. McNeill), the attendance has been encouraging and the usual good work has been done.

Regarding the bulletins issued in connection with the work on the Metallurgical Laboratory only a few of the original lots printed are left in most cases, and through references to their contents from time to time in various mining and other magazines, inquiries for copies come from all parts of the world.

Some small changes in the requirements for Preparatory Mathematics which it is hoped will be of benefit generally have been introduced, leading to corresponding changes in the Scholarship requirements, especially for the Junior and Entrance Scholarships. These changes follow upon some alteration in the University Junior Certificate mathematics, and are very suitable for our own needs, but are likely to entail some small cost to assist the present lecturer in mathematics for two hours per week.

With an increased attendance which may be looked for in 1930, extra assistance in several departments which could be provided for by the appointment of a junior officer will become necessary. The want of such assistance for the last two years, even with fewer students, has always been felt. Such officer's time would be apportioned amongst the departments affected.

During the year, about the end of the second term, owing to the falling-off in the attendance at the drawing class held at the Boulder Technical School an arrangement was reached by which those who wished to continue could do so at the School of Mines without cost and without loss of status. Unfortunately it was little availed of.

It is pleasing to note in a recent (January, 1930) paper the complimentary remarks passed at the meeting of the Lake-View and Star, Ltd., in London, by the chairman, Mr. J. A. Agnew, on the flotation test work done at the School for his company by Messrs. Clarke and Moore—work which largely influenced the decision of his company to install a 5,000 ton per month flotation unit.

I attach a number of sheets of data, statistical, etc., bearing on the results of the year's operations.

T. BUTEMENT,
Acting Director

SCHOOL OF MINES OF WESTERN AUSTRALIA.

Examiners.

The following Examiners conducted the Examination in November, 1929:—

Subject.	Examiners.
Preparatory Mathematics	T. Butement, A.O.U.S.M.; R. Davis, M.Sc.; and E. Illidge, B.Sc.
Preparatory Chemistry	B. H. Moore, M.E., F.S.A.S.M.
Preparatory Physics and Electricity	D. McDougall, A.I.E.E.
Preparatory Geology	C. O. G. Larcombe, D.Sc., F.S.T.C., F.G.S.
Preparatory Mechanical Drawing	H. B. Newman.
Mathematics I.	E. H. Illidge, B.Sc., and R. Davis, M.Sc.
Mechanics—Theoretical	R. Davis, M.Sc., and E. H. Illidge, B.Sc.
Physics I.	R. Davis, M.Sc., and D. McDougall, A.I.E.E.
Chemistry I.	B. H. Moore, M.E., F.S.A.S.M., and R. R. Baxter, B.Sc.
Engineering Chemistry I. and II.	L. W. Phillips, M.Sc., Dip.Ed., A.A.C.I., and B. H. Moore, M.E., F.S.A.S.M.
Assaying I. Assaying II. Metallurgy I. and II.	R. H. Moore, M.E., F.S.A.S.M., and G. S. Compton, B.Sc.
Petrology Mineralogy Geology	C. O. G. Larcombe, D.Sc., F.S.T.C., F.G.S., and G. S. Compton, B.Sc.
Mining Geology	C. O. G. Larcombe, D.Sc., F.S.T.C., F.G.S.
Practical Mathematics	E. H. Illidge, B.Sc.
Mechanical Drawing I. and II.	J. H. Tate.
Applied Mechanics Building Construction	B. H. Moore, M.E., F.S.A.S.M., and J. H. Tate.
Mechanical Engineering I. and II.	J. H. Tate and T. Butement, A.O.U.S.M.
Machine Design Surveying I. and II. Mining I. and II.	T. Butement, A.O.U.S.M.
Electrical Engineering I. and II.	D. McDougall, A.I.E.E.
Fitting and Turning I. and II.	C. D. Slee.
Gas Engine Indicator	A. R. E. Bosustow.
Engine Driving	J. B. McNeill.

Junior Scholarships.

Subject.	Examiners.
Physical Geography	C. O. G. Larcombe, D.Sc., F.S.T.C., F.G.S.
Mathematics English	E. Illidge, B.Sc., and B. H. Moore, M.E., F.S.A.S.M.

ATTENDANCES—1929.

Subjects.	Effective Enrolment.		
	1st Term.	2nd Term.	3rd Term.
Elementary Mathematics	15	14	5
Preparatory Mathematics	40	35	29
Preparatory Chemistry	19	16	11
Preparatory Physics	31	29	24
Preparatory Mechanical Drawing	33	28	18
Preparatory Geology	6	6	5
Mathematics, First Course	17	10	8
Theoretical Mechanics	4	4	4
Physics, First Course	9	6	6
Chemistry, First Course	7	6	5
Engineering Chemistry, First Course	3	3	3
Engineering Chemistry, Second Course	1	1	1
Assaying, First Course	3	1	1
Assaying, Second Course	1	1	1
Metallurgy, First Course	...	...	1
Metallurgy, Second Course	1	1	1
Geology	5	5	5
Mining and Economic Geology	...	3	3
Mineralogy	2	2	2
Petrology	2	2	2
Mining, First Course	2	3	3
Mining, Second Course (Mine Sampling)	4	...	...
Mining, Second Course (Ore Dressing)	3	3	4
Mining, Second Course (Mine Accounts and Administration)	...	2	1
Surveying, First Course	3	3	3
Surveying, Second Course	2	2	2
Mechanical Drawing, First Course	13	9	10
Mechanical Drawing, Second Course	6	4	3
Applied Mechanics	...	...	...
Mechanical Engineering, First Course	6	5	5
Mechanical Engineering, Second Course	1	1	1
Building Construction	1	1	1
Gas Engine and Indicator	13	8	5
Engine Driving, First Course	18	15	12
Electrical Engineering, First Course	4	4	4
Fitting and Turning, First Course	28	19	17
Fitting and Turning, Second Course	7	5	7
Machine Design	1	1	1
Practical Mathematics	5	5	4
Total Enrolments	316	263	218
Individual Students	189	131	105

	1928.			1929.		
				Terms.		
	1st Term.	2nd Term.	3rd Term.	1	2	3
Total Enrolments	278	258	206	316	263	218
Individual Students	106	101	84	189	131	105

EXAMINATION RESULTS.

The following table shows the passes obtained by students of the Western Australian School of Mines, Kalgoorlie, at the Annual Examinations held in November, 1929, including the Supplementary Exminations held in February, 1929:—

Subject.	Class of Pass.		
	Credit.	Pass.	Totals.
Preparatory Mathematics	1	2	3
Preparatory Mathematics (Arithmetic) ...	...	4	4
Preparatory Mathematics (Algbera) ...	...	4	4
Preparatory Mathematics (Geometry) ...	1	5	6
Preparatory Chemistry	...	5	5
Preparatory Mechanical Drawing ...	2	12	14
Preparatory Physics and Electricity ...	4	8	12
Preparatory Geology	1	2	3
Mathematics—First Course (Geometry) ...	...	2	2
Theoretical Mechanics	...	2	2
Physics—First Course	...	4	4
Chemistry—First Course	...	3	3
Engineering Chemistry—First Course ...	1	2	3
Assaying—First Course	...	1	1
Assaying—Second Course	...	1	1
Metallurgy—Second Course	1	...	1
Geology	...	2	2
Mineralogy	1	...	1
Petrology	1	1	2
Mining and Economic Geology	...	1	1
Mining—First Course	...	2	2
Mining—Second Course (Ore Dressing) ...	1	2	3
Mining—Second Course (Mine Sampling)	1	2	3
Mining—Second Course (Mine Administration)	...	1	1
Surveying—First Course	...	1	1
Surveying—Second Course	2	2	4
Mechanical Drawing—First Course ...	6	4	10
Mechanical Drawing—Second Course ...	3	...	3
Building Construction	1	...	1
Mechanical Engineering—First Course ...	1	3	4
Mechanical Engineering I. (Gas Engine)	1	2	3
Mechanical Engineering I. (Indicator) ...	...	3	3
Mechanical Engineering, Second Course ...	1	...	1
Electrical Engineering—First Course ...	...	3	3
Electrical Engineering—Second Course ...	...	1	1
Fitting and Turning—First Course ...	3	12	15
Fitting and Turning—Second Course ...	2	1	3
Machine Design	3	2	5
Practical Mathematics	1	1	2
Engine-Driving—First Course	1	5	6
Engine-Driving—Second Course	2	2	4
Totals	42	110	152

ASSAYER'S CERTIFICATES.

The following have gained Certificates:—

Adams, H.	P.T.S. ..	March, 1904.
Adams, P.	P.T.S. ..	February, 1905.
Beech, S. J.	K.S.M. ..	November, 1906.
Brown, T.	P.T.S. ..	November, 1906.
Brooking, J.	P.T.S. ..	November, 1906.
Hutchinson, D. M. ..	K.S.M. ..	November, 1906.
Banks, R.	K.S.M. ..	November, 1908.
Gabel, J.	K.S.M. ..	November, 1908.
Pike, R. W.	P.S.M. ..	November, 1908.
Woolf, M.	K.S.M. ..	November, 1908.
Baxter, R. R.	P.T.S. ..	November, 1909.
Bradley, W. S.	K.S.M. ..	November, 1909.
Burrows, M. F.	P.T.S. ..	November, 1909.
Compton, G. S.	P.T.S. ..	November, 1909.
Cook, H. J.	P.T.S. ..	November, 1909.
Klem, L. G.	P.T.S. ..	November, 1909.
Fraser, W.	K.S.M. ..	November, 1910.
Rowledge, H. P.	P.T.S. ..	November, 1910.
Benjamin, L. R.	P.T.S. ..	November, 1911.
Jackson, L. T. C.	P.T.S. ..	November, 1911.
Leevers, J. C.	K.S.M. ..	November, 1911.
Lapsley, R. G.	P.T.S. ..	November, 1912.
Kurth, E. E.	K.S.M. ..	November, 1913.
Grace, J. N. A.	P.T.S. ..	November, 1916.
Noall, J. C.	K.S.M. ..	November, 1917.
Cecil, Clyde	K.S.M. ..	November, 1918.
Terrell, J. H.	K.S.M. ..	November, 1918.
Nairn, T. W.	K.S.M. ..	November, 1918.
Roberts, T. J.	K.S.M. ..	November, 1919.
Chapman, F. E.	P.T.S. ..	November, 1920.
Lethlean, H. V.	K.S.M. ..	November, 1921.
Carrigg, C. G.	K.S.M. ..	November, 1922.
Greer, J. H.	K.S.M. ..	November, 1922.
Mundle, E. B.	K.S.M. ..	November, 1922.
Esdaile, A. N.	K.S.M. ..	November, 1923.
Paterson, A. V.	K.S.M. ..	November, 1923.
Simons, H. H. J.	P.T.S. ..	November, 1924.
Brown, C. W.	K.S.M. ..	November, 1926.
Lynch, T.	K.S.M. ..	November, 1926.
Boyer, C.	P.T.S. ..	November, 1927.
Arnatt, R. F.	K.S.M. ..	November, 1929.

INDUSTRIAL CHEMIST'S CERTIFICATES.

The following have gained Certificates:—

Cecil, C.	K.S.M. ..	November, 1921.
Chapman, F.	P.T.S. ..	November, 1922.
Carrigg, C. G.	K.S.M. ..	November, 1922.
Esdaile, A. N.	K.S.M. ..	November, 1922.
Paterson, A. V.	K.S.M. ..	November, 1924.
Lynch, T.	**K.S.M. ..**	**November, 1927.**

MINE SURVEYOR'S CERTIFICATES.

The following have gained Certificates:—

Peat, J.	K.S.M. ..	November, 1909.
Adams, H.	K.S.M. ..	November, 1910.
Banks, R.	K.S.M. ..	November, 1911.
Gabel, J.	K.S.M. ..	November, 1911.
Pike, R. W.	K.S.M. ..	November, 1912.
Godden, F. R. W.	K.S.M. ..	November, 1915.
Mundle, E. B.	K.S.M. ..	November, 1915.
Leevers, J. C.	K.S.M. ..	November, 1916.
Crutchett, I. A.	K.S.M. ..	November, 1920.
Powell, T.	K.S.M. ..	November, 1921.
Agnew, R. J.	K.S.M. ..	November, 1922.
Crutchett, E. G.	K.S.M. ..	November, 1922.
Davies, I.	K.S.M. ..	November, 1922.
Eddy, J. T.	K.S.M. ..	November, 1922.
Rosenberg, J. M.	K.S.M. ..	November, 1923.
Gibbons, L. P. J.	K.S.M. ..	November, 1924.
Terrell, J. H.	K.S.M. ..	November, 1924.
Manners, J. E.	K.S.M. ..	November, 1926.
Golding, H. D.	K.S.M. ..	November, 1927.
Jensen, H.	K.S.M. ..	November, 1927.
Finucane, K. J.	K.S.M. ..	November, 1928.
Bell, W. R.	K.S.M. ..	November, 1928.
Arnatt, R. F.	K.S.M. ..	November, 1928.

DRAUGHTSMAN'S CERTIFICATES.

The following have gained Certificates:—

Galt, W.	K.S.M. ..	November, 1915.
Butement, J. C.	K.S.M. ..	November, 1915.
Edmondson, F. C.	K.S.M. ..	November, 1915.
Lang, J H.	K.S.M. ..	November, 1915.
Davies, W.	K.S.M. ..	November, 1917.
Weselman, C.	K.S.M. ..	November, 1917.
Thompson, E. P.	K.S.M. ..	November, 1920.
Gill, L. J.	K.S.M. ..	November, 1921.
Macbeth, R. A.	K.S.M. ..	November, 1921.
Rosenberg, J. M.	K.S.M. ..	November, 1921.
Spalding, J.	K.S.M. ..	November, 1922.
Taylor, H.	K.S.M. ..	November, 1922.
Sinclair, R. J.	K.S.M. ..	November, 1925.
Thrupp, T. W.	K.S.M. ..	November, 1926.
Ehlers, C. R.	K.S.M. ..	November, 1927.
Johns, E. N.	K.S.M. ..	November, 1927.
Meredyth, C. C.	K.S.M. ..	November, 1927.
Bell, C. H.	K.S.M. ..	November, 1928.
Crocos, A. J.	K.S.M. ..	November, 1928.
Moody, C. O. V.	K.S.M. ..	November, 1928.
Newman, H. B.	K.S.M. ..	November, 1928.
Warman, C. H.	K.S.M. ..	November, 1928.
Baker, Stanley	K.S.M. ..	November, 1929.
Glendinning, A. R.	K.S.M. ..	November, 1929.
Manners, G. S.	K.S.M. ..	November, 1929.
Sargent, R. A. S.	K.S.M. ..	November, 1929.

ELECTRICIAN'S CERTIFICATES.

The following have gained Certificates:—

Galt, W.	K.S.M. ..	November, 1915.
Butement, J. C.	K.S.M. ..	November, 1915.
Edmondson, C. F.	K.S.M. ..	November, 1915.
Lang, J. H.	K.S.M. ..	November, 1915.
Davies, W.	K.S.M. ..	November, 1917.
Weselman, C.	K.S.M. ..	November, 1917.
Thompson, E. P.	K.S.M. ..	November, 1920.
Gill, L. J.	K.S.M. ..	November, 1921.
Macbeth, R. A.	K.S.M. ..	November, 1921.
Rosenberg, J. M.	K.S.M. ..	November, 1921.
Spalding, J.	K.S.M. ..	November, 1923.
Taylor, Harry	K.S.M. ..	November, 1923.
Meredyth, C. C.	K.S.M. ..	November, 1925.
Sinclair, R. J.	K.S.M. ..	November, 1925.
Thrupp, T. W.	K.S.M. ..	November, 1926.
Johns, E. N.	K.S.M. ..	November, 1927.
Ehlers, C. R.	K.S.M. ..	November, 1927.
Glendinning, A. R.	K.S.M. ..	November, 1928.
Moody, C. O. V.	K.S.M. ..	November, 1928.
Bell, C. H.	K.S.M. ..	November, 1929.

GEOLOGIST'S CERTIFICATES.

The following have gained Certificates:—

Gabel, J.	K.S.M. ..	November, 1911.
Leevers, J. C.	K.S.M. ..	November, 1916.
Mundle, E. B.	K.S.M. ..	November, 1920.
Agnew, R. J.	K.S.M. ..	November, 1923.
Terrell, J. H.	K.S.M. ..	November, 1927.
Manners, J. E.	K.S.M. ..	November, 1927.
Arnatt, R. F.	K.S.M. ..	November, 1929.

DIPLOMAS.

The following students have gained Diplomas:—

Beech, S. J. (K.S.M.), Diploma in Metallurgy, November, 1906.

Adams, P. (P. and M.), Diploma in Metallurgy, November, 1907.

Adams, H. (P. and K.), Diploma in Metallurgy, November, 1908.

Banks, R. (C. and K.), Diploma in Metallurgy, November, 1910.

Burrows, M. F. (P. and K.), Diploma in Metallurgy, November, 1910.

Compton, G. S. (P.T.S.), Diploma in Metallurgy, November, 1910.

Cook, H. J. (P.T.S.), Diploma in Metallurgy, November, 1910.

Gabel, J. (K.S.M.), Diploma in Metallurgy, November, 1910.

Gabel, J. (K.S.M.), Diploma in Mining, November, 1911.

Pike, R. W. (P. and K.), Diploma in Metallurgy, November, 1911.

Galt, W. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1915.

Butement, J. C. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1915.

Edmondson, F. C. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1915.

Lang, J. H. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1915.

Grace, J. N. A. (P.T.S.), Diploma in Metallurgy, November, 1915.

Bradley, W. S. (K.S.M.), Diploma in Metallurgy, November, 1915.

Kurth, E. E. (K.S.M.), Diploma in Metallurgy, November, 1916.

Getty, A. (K.S.M.), Diploma in Metallurgy, November, 1916.

LeMesurier, C. R. (K.S.M.), Diploma in Metallurgy, November, 1916.

Leevers, J. C. (K.S.M.), Diploma in Mining, November, 1916.

Davies, Watcyn (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1917.

Weselman, Carl (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1917.

Nairn, T. W. (K.S.M.), Diploma in Metallurgy, November, 1919.

Mundle, E. B. (K.S.M.), Diploma in Mining, November, 1920.

Thompson, E. P. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1920.

Gill, L. J. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1921.

Macbeth, R. A. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1921.

Rosenberg, J. M. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1921.

Rowledge, H. P. (P. and K.), Diploma in Metallurgy, November, 1922.

Taylor, Harry (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1923.

Agnew, R. J. (K.S.M.), Diploma in Mining, November, 1924.

Spalding, J. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1924.

Sinclair, R. J. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1925.

Cecil, Clyde (K.S.M.), Diploma in Metallurgy, November, 1926.

Thrupp, Thos. W. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1926.

Ehlers, C. R. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1927.

Johns, E. N. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1927.

Meredyth, C. C. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1927.

Manners, J. E. (K.S.M.), Diploma in Mining, November, 1927.

Terrell, J. H. (K.S.M.), Diploma in Mining, November, 1927.

Moody, C. O. V. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1928.

Arnatt, R. F. (K.S.M.), Diploma in Mining, November, 1929.

Bell, C. H. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1929.

W.A. SCHOOL OF MINES.

Positions held by Students in 1929, *chiefly in W.A.*

(Incomplete through the difficulty of following up the movements of many.)

Agnew, R. J., Assistant Manager, Central European Mines, Klagenfurt, Jugo-Slavia.

Arnatt, R. F., Treatment Plant, Lake View and Star Gold Mines, Ltd., Boulder.

Banks, R., Head Surveyor, Lake View and Star Gold Mines, Ltd., Boulder.

Bell, C. H., lately in Midland Junction Workshops, now in Bridge Design Section of Main Roads Board, W.A.

Binet, R., in Survey Office, Lake View and Star Gold Mines, Ltd., Boulder.

Blurton, N. C., in charge of Electric Light Station, Leonora, W.A.

Brown, C. W., Chemist, South Kalgurli Gold Mine, Ltd., Boulder.

Butement, J. C., Inspection Engineer with Milliken Bros. & Blaw-Knox, London.

Butement, T. G., Technical Engineer with Mechanical Supplies, Adelaide, S.A.

Cecil, C., Lecturer, Perth Technical College, Perth.

Crutchett, I., in Public Works Department, Perth.

Crutchett, E. G., Assistant Surveyor, Great Boulder Proprietary Gold Mine, Boulder.

Davies, M., in business in Perth as an Indent Engineer.

Davies, I., in Public Works Department, Perth.

Davies, W., in Public Works Department, Perth.

Dingle, M. M., practising as an Electrician, Adelaide, S.A.

Duke, C., Surveyor, Collie Coal Mines, Collie, W.A.

Edmondson, F. C., lately Engineer, now General Manager of Electricity and Gas Department, Perth City Council, Perth.

Ehlers, C. R., Assistant to Engineer, Perth City Council, Perth.

Esdaile, A. N., Chemist with Zinc Corporation, Broken Hill, N.S.W.

Fairley, T. C., Inspector for electrical work, Municipality of Kalgoorlie.

Feldtman, W. R., Assistant Government Geologist, W.A.

Finucane, K. J., lately in Geological Survey, W.A., now Assistant Geologist in Tasmania.

Gibbons, L. P., lately Surveyor, Pahang Consolidated Tin Mine, Federated Malay States, now in the Engineer's Office, Perth City Council, Perth.

Glendinning, A. R., Electrical Engineer's Department, G.P.O., Adelaide, S.A.

Godden, F. W., Mining Engineer in New Zealand for Malay tin interests.

Griffiths, D. D., Lecturer in Electrical Engineering, Hawthorn Technical College, Melbourne, Victoria.

Golding, H. D., lately in Survey Office, Golden Horseshoe Mine, now in Electrical Department, Lake View and Star G.M., Ltd., Boulder.

Greenhill, T. W., Manager Enterprise Gold Mine, Kalgoorlie.

Grigg, J., Manager of tin properties, Federated Malay States.

Jensen, H., in Survey Office, Lake View and Star G.M., Ltd., Boulder.

Johns, E. N., in Electrical Department, Municipality of Boulder.

Kingdon, H., A.R.S.M., lately Chemist, now Surveyor on Sons of Gwalia Mine, Gwalia, W.A.

Lang, J. H., Assistant Manager Malloch Bros., Perth.

Lynch, T., in charge of roasters, Oriental Consolidated Mining Co., Korea.

Macbeth, R. A., in Public Works Department, Perth.

Manners, J. E., lately Manager Carabobo-Venezuela G.M., Ltd., now on Rio Tinto Copper Mines, Spain.

Meredyth, C. C., Lecturer in Mechanical and Electrical Engineering, Perth Technical College, Perth, now Lecturer in Mechanical Engineering, W.A. School of Mines.

Mundle, E. B., lately Surveyor, South Kalgurli G.M., Ltd., now Underground Manager on their Croesus Proprietary Lease.

McDermott, C. J., in Survey Office Lake View and Star G.M., Ltd., Boulder.

Moody, C. O. V., with Plant Engineer as Draughtsman, Lake View and Star G.M., Ltd., Boulder.

Nevile, R. L., lately in Midland Junction Workshops, now Assistant to District Engineer, W.A.G. Railways, Kalgoorlie.

Newman, H. B., Engineer, South Kalgurli Consolidated G.M., Boulder.

Nairn, T. W., Technical Manager Cresco Fertiliser Works, Bassendean, W.A.

Noall, J., Surveyor and Assistant Manager Sungei Besi Tin Mine, Federated Malay States.

Nowland, L. R., Engineer Wiluna Gold Mines, Ltd., Wiluna, W.A.

Oakley, P. R., in Drafting Office, Wiluna Gold Mines, Wiluna, W.A.

Powell, T., lately Surveyor, Golden Horseshoe Mines, now in P.W.D., Perth.

Rosenberg, J. M., Engineer with Chas. Atkins & Co., Perth.

Rosenbrock, E. L., with Roads and Bridges Department, Perth.

Sargent, R. A., in Electric Light Department, Municipality of Kalgoorlie.

Shaw, C. C., in charge of plant on Lake View and Star G.M., Ltd., Boulder.

Terrell, J. H., Surveyor, Perseverance Gold Mine, Ltd., Boulder.

Thrupp, T. W., Lecturer in a Technical College, Melbourne, Victoria.

SCHOLARSHIP EXAMINATIONS, 1929.

Junior Scholarship.

Candidate.	District.
Hair, Don	Kalgoorlie.

Don Hair gains the Junior Scholarship.

Entrance Scholarship.

Candidate.	District.
Turner, Ronald A.	Kalgoorlie.
Martin, Ernest A.	Kalgoorlie.

Scholarship not awarded.

Chamber of Mines Scholarship in Metallurgy.

Candidate.	District.
Edwards, Herbert E.	Kalgoorlie.

H. E. Edwards has been recommended for this Scholarship.

The Critchley Parker Prize.

The following have been recommended for the prizes offered by Critchley Parker, Esq., Melbourne:—

H. Jensen. S. Baker.

Institute of Mine Surveyers of W.A., Inc., Prizes (Books).

For these the following have been recommended:—

H. E. Edwards; W. R. Bell; H. Jensen.

W.A. SCHOOL OF MINES, KALGOORLIE.

ANNUAL EXAMINATIONS, 1929.

("T" denotes terminal pass only.)

Preparatory Chemistry.

Pass—
Turner, Ronald A. } equal
Wright, George S. }
Edwards, Herbert E.
Black, Charles H.
May, Allan.

Preparatory Mechanical Drawing.

Credit—
Edwards, Herbert E.
Turner, Ronald A.

Pass—
Martin, Ernest A.
Wright, George S.
Toy, John
Daws, Stanley E. } equal
Taggart, Reginald G. }
Schoeffler, Thos. E.
Perkins, Walter R.
Gregory, Jas. S. } equal
Kirkwood, John }
Le Boydre, Frank L. } equal
Virgo, Herbert E. (T) }
Thomas, Herbert W.

Preparatory Physics.

Credit—
Edwards, Herbert E.
Moore, Geo. M.
Turner, Ronald A.
Wright, Geo. S.

Pass—
Erbe, John W.
Main, Eric W.
Martin, Ernest A.
Correy, John L. (T)
May, Allan
Toy, John
Black, Chas. H.
Mathews, Frank R.

Preparatory Geology.

Credit—
Edwards, Herbert E.

Pass—
Reid, Miss A. M.
Turner, Ronald A.

Preparatory Mathematics.

(All Sections.)

Credit—
Edwards, Herbert E.

Pass—
Wright, Geo. S.
May, Allan W.

(Arithmetic Section.)

Pass—
Taggart, Reginald G.
Miles, Jas. A.
Rowe, Richard L.
Turner, Ronald A.

(Algebra Section.)

Pass—
Erbe, John W.
Moore, Geo. M.
Miles, Jas. A.

(Geometry Section.)

Credit—
Erbe, John W.

Pass—
Moore, Geo. M.
Main, Eric W.
Turner, Ronald A. } equal
Martin, Ernest A. }

Mathematics—First Course.

(Geometry Section.)

Pass—
Terrell, Walter.
McMahon, Edward J.

ANNUAL EXAMINATIONS, 1929—*continued.*

Theoretical Mechanics.

Pass—
Jensen, Harold E.
Sargent, Richard A. S.

Physics—First Course.

Pass—
Thomas, Fred. M.
Evans, Basil P.
Terrell, Walter.
Thomas, C. O. A.

Chemistry—First Course.

Pass—
Baker, Stanley.
Smith, Allan M.

Engineering Chemistry—First Course.

Credit—
Arnatt, Robert F.

Pass—
Jensen, Harold.
Golding, Hollis D.

Assaying—First Course.

Pass—
Smith, Allan M.

Assaying—Second Course.

Pass—
Arnatt, Robert F.

Metallurgy—Second Course.

Credit—
Arnatt, Robert F.
(Thesis accepted).

Pass—
Esdaile, Alex. N.
(Thesis accepted. Written Exam., 1919).

Geology—First Course.

Pass—
Moody, Chas. O. V.
Rule, Geo. J.

Mineralogy.

Credit—
Bell, William R.

Petrology.

Credit—
Arnatt, Robert F.

Pass—
Bell, Wm. R.

Mining Geology.

Pass—
Arnatt, Robert F.
(Thesis now accepted. Written Exam., 1928).

Mining—First Course.

Pass—
Moody, Chas. O. V.
Binet, Robert.

Mining—Second Course.

(Ore Dressing.)

Credit—
De Passey, Roy.

Pass—
McInerney, Brian.
Truscott, Kenneth.

Mine Sampling.

Credit—
De Passey, Roy.

Pass—
Truscott, Kenneth.
Binet, Robert.

Mine Administration.

Pass—
Truscott, Kenneth.

Surveying—First Course.

Pass—
Newman, Henry B.

Surveying—Second Course.

(Provisional Pending Plan.)

Pass—
Johns, Edward N.

Credit—
Finucane, Kevin J.
(Exam., 1927, Plan now accepted.)
Arnatt, Robert F.
(Exam., 1928, Plan now accepted.)

Pass—
Bell, William R.
(Exam., 1928, Plan now accepted.)

Mechanical Drawing—First Course.

Credit—
Slee, Cyril D.
Martin, Chas. D.
Taylor, Geo. A.
Taylor, Robert,
Thomas, Fred. M.
Cotterell, Cecil H.

Pass—
Taggart, Joseph H.
Miles, Jas. A.
Beames, Hurtle M.
Murphy, Dennis W.

Mechanical Drawing—Second Course.

Credit—
Glasson, Leslie J.
Bell, William R.
Main, Eric W.

Mechanical Engineering—First Course.

Credit—
Jensen, Harold.

Pass—
Smith, John W.
Stubbs, Frank H. R.
Taggart, Joseph H. C.

Mechanical Engineering—Second Course.

Credit—
Sargent, Richard A. S.

Mechanical Engineering—First Course.
(Gas Engine.)

Credit—
Allan, Archibald T.

Pass—
Gould, William T.
Tanner, Francis L.

Indicator.

Pass—
Allan, Archibald T.
Gould, William T.
Tanner, Francis L.

Machine Design.

Credit—
Parker, Peter J.
(Written Exam., 1928. Thesis now accepted,)
Baker, Stanley.
(Written Exam., 1926. Thesis now accepted,)
Gendinning, Angus R.
(Written Exam., 1927. Thesis now accepted,)

Pass—
Shaw, Edward R.
(Written Exam., 1928. Thesis now accepted,)
Manners, George S.
(Written Exam., 1925. Thesis now accepted,)

Building Construction.

Credit—
Jensen, Harold.

Electrical Engineering—First Course.

Pass—
Newman, Henry B.
Parker, Peter J.
Shaw, Edward R.

Electrical Engineering—Second Course.

Pass—
Bell, Chas. H.
(Written Exam., 1926. Thesis now accepted,)

Fitting and Turning—First Course.

Credit—
Weiland, Stanley J.
Koetsveld, William A.
Wood, Herbert C. (T)

Pass—
Taylor, Robert } equal.
Miles, James A. }
Rowe, Richard L.
Virgo, Herbert E. } equal.
Taylor, Geo. A. }
Daws, Stanley E. (T)
Le Boydre, Frank L.
Schoeffler, Thos. E. } (T)
Taggart, Reginald G. } equal.
Kirkwood, John }
Thomas, Herbert W. }
Mortimer, Geoffrey D.

ANNUAL EXAMINATIONS, 1929—*continued.*

Fitting and Turning—Second Course.

Credit—
Perkins, Walter R.
Graham, Kenneth J. (T).

Pass—
Murphy, Dennis W.

Engine Driving—First Course.

Credit—
Browne, George T.

Pass—
King, William T.
Stubbs, Frank H. R.
Morris, George.
Gould, William T.
Marsh, Reginald S.

Engine Driving—Second Course.

Credit—
Stevens, Alan J.
Baker, Clarence E. (T)

Pass—
Scott, Charles C.
Beetson, George C.

Practical Mathematics.

Credit—
Birch, Reginald D.

Pass—
Baker, Stanley.

SUPPLEMENTARY EXAMINATIONS.

(Held in February, 1929.)

Preparatory Mathematics.
(Algebra Section.)

Pass—
Godenzi, William E.

Chemistry—First Course.

Pass—
Newman, Henry B.

YEAR'S FEE SCHOLARSHIPS.

Subject.	Holder.
Preparatory Mechanical Drawing	Edwards, H. E.
Preparatory Physics	Edwards, H. E.
Preparatory Geology	Edwards, H. E.
Preparatory Mathematics	Edwards, H. E.
Engineering Chemistry I.	Arnatt, R. F.
Metallurgy II.	Arnatt, R. F.
Petrology	Arnatt, R. F.
Mineralogy	Bell, W. R.
Mine Sampling	De Passey, R.
Ore Dressing	De Passey, R.
Mechanical Drawing I.	Slee, C. D.
Mechanical Drawing II.	Glasson, L. J.
Mechanical Engineering I.	Jensen, H.
Mechanical Engineering II.	Sargent, R. A. S.
Gas Engine	Allan, A. T.
Building Construction	Jensen, H.
Fitting and Turning I.	Weiland, S. J.
Fitting and Turning II.	Perkins, W. R.
Engine Driving I.	Browne, G. T.
Engine Driving II.	Stevens, A. J.
Practical Mathematics	Birch, R. D.

DIVISION VI.

Report of the Chief Inspector of Machinery and Chairman of the Board of Examiners for Engine-Drivers for the Year 1929.

The Under Secretary for Mines.

Sir,—

The report of the Deputy Chief Inspector of Machinery on the operations under the "Inspection of Machinery Act, 1921," for the year 1929 is submitted herewith.

It gives me pleasure to state that work done by the staff during the year was most satisfactory, there being ample evidence of its high standard of efficiency. As a result of careful control and united effort of all concerned, the operations under the Act were carried out without loss, indeed a small profit was recorded.

The total number of accidents reported was 42, an advance of 3 compared with the previous year, and including two fatal accidents—a decrease of 1.

The number of boilers and machinery groups are increasing steadily year by year. The necessity for the employment of an additional inspector, mentioned last year, is now imperative, if the standard of efficiency is to be maintained, and, in my opinion, it is essential that it should be maintained.

I have, etc.,

H. M. HOWE,
Chief Inspector of Machinery.

13th March, 1930.

Report of the Deputy Chief Inspector of Machinery.

The Chief Inspector of Machinery, Perth.

Sir,—

I have the honour to submit my report on the operations of the "Inspection of Machinery Act, 1921," for the year ending 31st December, 1929.

The work is dealt with under the following headings:—

1. Inspection of Boilers.
2. Explosions and interesting defects.
3. Inspection of Machinery.
4. Accidents to persons caused by boilers and machinery.
5. Board of Examiners for Engine-Drivers.

DIVISION I.

Inspection of Boilers.

The Return which follows shows the position in detail, but it might be briefly noted that the number of new registrations, 81, was within one of that of the year before, but owing to 21 old boilers being permanently condemned, 2 exported and 1 transferred. to the Navigation Department, the nett increase was only 57.

Out of the 3,530 useful boilers in the State, only 1,530 are in use, and all these but 9 were inspected and certificated. Those overdue were all done early in the new year. There were 37 more thorough inspections made than in 1928, but 43 fewer examinations under steam. This is accounted for by the increased work in both boiler and machinery inspection which could not be neglected, because of not being allowed to be worked without certificates.

The reason why only 1,521 certificates were issued although 1,563 thorough inspections were made, is partly because it sometimes happens that a second inspection has to be made before a boiler can be granted a certificate and partly because when a special inspection is made at owner's request for sale purposes, he is supplied with a detailed report and not a certificate.

It may be noticed that the increase in numbers is mainly in air receivers and vulcanizers, but although as much time may not be taken up with this class of work, it is offset by the extra care and time occupied in the inspection of the many boilers which are getting old.

Return No. 1—Showing Classification of Types of New Boiler Registrations for Year ended 31st December, 1929.

Types.	Total.
Vertical Stationary	7
Vertical Multitubular Stationary	3
Locomotive Portable Rectangular Firebox ...	2
Locomotive	1
Return Multitubular Stationary Underfired ...	1
Digester	1
Air Receiver	32
Vulcanizer	22
Steam-jacketed Vessel	8
Waste Heat	4
	81
Imported from United Kingdom	21
,, ,, United States of America ...	2
,, ,, Germany	3
,, ,, Eastern States	29
,, ,, Unknown sources	9
Made in this State *	17
	81
Vertical Stationary *	1
Digester	1
Air Receiver	13
Vulcanizer	1
Steam-jacketed Vessel	1
	17

Return No. 2—Showing Classification of Various Types of Useful Boilers in Proclaimed Districts on 31st December, 1929.

Types of Boilers.	Districts worked from Perth.	District worked from Kalgoorlie.	Unproc. Areas.	Totals. 1929.	Totals. 1928.
Lancashire	49	54	...	103	103
Cornish	221	375	...	596	597
Semi-Cornish	34	15	...	49	49
Vert. Stat.	354	285	...	639	640
,, Port	77	8	...	85	85
,, Mult. Stat.	36	19	...	55	53
,, ,, Port	27	2	...	29	29
,, Pat. Tubular ...	8	...	...	8	8
Loco. Rect. Firebox Stat....	98	44	...	142	143
,, ,, ,, Port...	268	32	...	300	303
,, Circ. ,, ,,	144	3	...	147	147
Locomotive	84	39	...	123	121
Water Tube	107	115	...	222	223
Return Mult. Underfired Stat.	80	56	...	136	136
,, ,, Underfired Port	3	4	...	7	7
,, ,, Int. Fired Stat.	41	5	...	46	46
,, ,, Int. Fired Port.	2	...	...	2	2
Egg-ended and other types not elsewhere specified	37	15	51	103	97
Digesters	46	4	...	50	52
Air Receivers	269	99	...	368	335
Gas ,, ...	4	...	...	4	4
Vulcanizers...	138	3	...	141	122
Steam Jacketed Vessels ...	171	4	...	175	168
Total Registrations useful boilers	2,298	1,181	51	3,530	3,470
Total boilers out of use 31st December, 1929	1,014	935	...	1,949	1,903

Return No. 3—Showing Operations in Proclaimed Districts during Year ended 31st December, 1929.

(BOILERS ONLY.)

——	Districts worked from Perth.	Districts worked from Kalgoorlie.	Unproc. Area.	Totals. 1929.	Totals. 1928.
Total number of useful boilers registered	2,298	1,181	51	3,530	3,470
New boilers registered during year	72	9	...	81	82
Boilers reinstated ...	2	1	...	3	1
Inspections for year:					
Thorough	1,323	240	...	1,563	1,526
Working	17	7	...	24	67
Boilers condemned during year:					
Temporarily	57	1	...	58	60
Permanently	21	...	...	21	33
Boilers sent to other States during year	2	...	...	2	1
Transferred to other Departments	1	...	...	1	5
Transferred from other Departments	...	...	...	...	4
Number of Notices for repairs issued during year	289	41	...	330	470
No. of Certificates issued including those issued under Section 30 during year	1,284	237	...	1,521	1,512

DIVISION II.

Explosions and interesting Defects.

We are fortunate in not having any explosions to chronicle.

Among the few interesting defects, the most important to recall was that in the waste-heat boilers installed early in the year at the Sons of Gwalia Mine. Three such boilers were erected, each capable of producing one-tenth of the horse-power of the gas engine providing the heat from its exhaust. The unit consists of a preheater and boiler, and it was found after a run of a few months that all the tubes in one and several in the other two preheaters had to be renewed owing to severe pitting in the upper side of tubes. The effect was considered to be mainly due to oxygen, and a de-aerating apparatus was designed to combat it, by removing as much as is practicaally possible. In this the feed water is brought to boiling point in the first part of a horizontal chamber, and then passes through a mass of iron turnings to a hot well hermetically sealed by a film of oil to prevent re-entry of the extracted oxygen. This mine has always been handicapped by bad boiler water, but it is fortunate in having a management keenly alive and determined to battle with all difficulties and achieve the highest efficiency obtainable.

DIVISION III.

Inspection of Machinery.

The total registration for the year, viz., 7,675, is an increase of 451 over last year. There were 264 more inspections made and 50 more certificates issued. The apparent discrepancy between number of inspections and number certificates issued is explained by the fact that one certificate sometimes covers many groups of machinery.

There were 40 fewer steam certificates issued than last year, showing that steam is still being pushed out by oil and gas for motive power, particularly by oil because there was only one new gas engine registered against 75 run by oil. The number of compressed air engines remains about the same, but groups driven by electric motors show an increase of 382.

The number of lifts has increased by 21, 13 new passenger and eight new goods lifts, and an escalator.

Activity in the building trade has kept all the cranes busy, and they have been carefully watched because of frequent changes of positions.

Winding engines have had especial care because maintenance is not seriously studied by owners and many of those in use have been running for many years without much attention.

Lifts.	All Districts.
Passenger:	
Electrically driven	112
Goods:	
Electrically driven	100
Hydraulically driven	3
Belt driven	6
Total ..	221

Return No. 4—Showing Classification of various sources of Power Driven Machinery in use, or likely to be used again, in Proclaimed Districts, for year ended 31st December, 1929.

Classification.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals. 1929.	Totals. 1928.
Number of groups driven by steam engines	663	361	1,024	1,032
Number of groups driven by Oil engines	1,160	89	1,249	1,174
Number of groups driven by Gas engines	126	87	213	212
Number of groups driven by Compressed Air	8	27	35	34
Number of groups driven by Electric motors	4,683	468	5,151	4,769
Number of groups driven by Hydraulic pressure	3	...	3	3
Totals	6,643	1,032	7,675	7,224

Return No. 5—Showing Operations in Proclaimed Districts during Year ended 31st December, 1929.

MACHINERY ONLY.

—	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals.	
			1929.	1928.
Total registrations useful machinery	6,643	1,032	7,675	7,224
Total inspections made ...	5,455	366	5,821	5,557
Certificates (bearing fees) ...	2,584	129	2,713	2,623
Certificates (steam without fees)	280	28	308	348
Number of extension certificates issued under Section 42 of Act	...	...	...	...
Notices issued (machinery dangerous)	181	17	198	248

DIVISION IV.

Accidents to Persons caused by Machinery and Boilers.

We had the usual toll of minor accidents, the result more or less of want of reasonable care than real carelessness. As usual, wood-working machinery caused a large percentage of the total number.

There were 42 accidents reported for the year, three less than last year, although more machinery was in operation and 264 more inspections made. Of that number two were fatal, but neither due to the negligence of any person, but to sheer ill luck. One was at a lath saw bench with two saws on the spindle. Fence pickets were being cut, and by some mischance the bailer-out failed to hold a strip cut off, and it shot back and hit the sawyer in the abdomen and caused death. No suggestion was made at the inquest as to how the saws could be made less dangerous.

The second case was that of a mill attendant being caught between a crown and bevel pinion in one of the outback mines. The wheels actuated an agitator in a large vat and was slow moving. For lubrication, a grease cup was fitted on the base of the crown wheel and was easily screwed up from a platform alongside. There was no witness of the accident, but he was found with his shoulder between the teeth of the wheels, and it was surmised that he overbalanced while screwing down the grease cup and in saving himself put his right hand into the mesh of toothed wheels which drew in the arm up to the shoulder before it stopped the machine. When found he was dead.

This gearing has been running for some years, and up to the time of the accident had not been located as a dangerous spot either by the management or the inspector.

It is found very difficult to convince old hands of the utility of safety appliances, and they frequently pour scorn on what they term modern molly-coddling. Many employers resignedly consider accident insurance a necessary charge on their working costs, and consider that when the insurance premium is paid, and the guards ordered by the inspector are once fitted they are under no further obligation regarding the safety of employees.

Every employer should be a subscriber to the National Safety Council of Australia which has done so much good in Melbourne. For a small sum it will supply one large poster per week which can be exhibited in the most public part of the works and serve to remind workmen of the results of carelessness, either by some gruesome picture, witty slogan or catchy phrase. Two of the largest mines have become subscribers and I hope to hear of many more employers joining up because the value of such propaganda has been proved beyond all doubt in other countries.

Return No. 6—Showing Persons Killed or Injured by Machinery Accidents in Proclaimed Districts during Year ended 31st December, 1929.

Class of Machinery.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Total.
Sheet Metal Working:			
Stamping Press	4	...	4
Grooving Machine ...	1	...	1
Blanking Press	1	...	1
Guillotine	1	...	1
Metal Working:			
Emery Wheel	1	...	1
Wood Working:			
Spindle Shaper	3	...	3
Buzzer	6	...	6
Circular Saw	2	...	2
Thicknesser	1	...	1
Band Saw	1	...	1
Sand Paperer	1	...	1
Printing:			
Box Staying Machine ...	1	...	1
Box Cornering Machine ...	1	...	1
Saw Milling:			
Lath Cutting Machine ...	1 (1)	...	1 (1)
Passenger Lift	1	...	1
Agricultural:			
Chaffcutter	1	...	1
Brickmaking:			
Grinding Pan	1	...	1
General:			
Toothed Gearing... ...	...	1 (1)	1 (1)
Shafting	1	1	2
Belting	1	1	2
Steam Engine	...	2	2
Meat Mincer	1	...	1
Buffing Machine ...	2	1	3
Scalding	1	...	1
Gas Producer Explosion	1	...	1
Rope Spinner	1	...	1
Totals	36 (1)	6 (1)	42 (2)

Numbers within brackets denote fatal accidents.

DIVISION V.

Board of Examiners for Engine-drivers.

Forty-three days were occupied in matters pertaining to engine-drivers, eight of those being taken up with oral examinations and the remainder in marking papers, travelling, and dealing with complaints. Bunbury and Kalgoorlie were the only two centres able to muster a sufficient number of candidates to justify the Board leaving Perth. Twenty-one more certificates were issued than in 1928. These examinations have to be conducted with care, and sometimes much sympathy. The candidate within

touch of Technical Schools has no difficulty in attacking the written paper, and as a rule can reply promptly to oral questions, but the candidate who has lived all his life in the country, either in timber camps or outback mines, finds the written paper a great strain, and has to confess during the oral examination that he cannot grasp much from books, and has no other way of learning. Frequently such men make the best drivers because they learn to be self-reliant, and the Board treats them with patience and sympathy. The standard of candidates coming forward does not vary very much from year to year.

Three inquiries were conducted by the Board on overwinds on mines. One was due to the engine-driver having his attention taken by the platman while changing gear. The rope was released and the skip hung up. A severe caution was considered sufficient to meet the case.

In the second case a learner was putting in practice under the regular driver and while bailing water failed to stop the engine at the proper time, and an ascending tank of water was carried up to the safety thimble. The released rope wound into the engine room, the end smashing away part of the roof as it entered the engine room and dislocating one brake. The rope on descending tank was snapped off at the drum. As steam was shut off the engine stopped after being released from descending load, which was presumed to be a full tank of water because it occasionally happened that a tank would not be emptied because of it not being high enough to catch the releasing trigger, the emptying not being visible to the driver. It was apparently this very circumstance that caused the overwind by the inexperienced learner. He had been instructed to shut off steam when the ascending skip was 300 feet from the surface, but he had not been warned that the descending tank was sometimes full instead of empty, when the engine would require less steam, and so have to be shut off much earlier than when running under normal conditions. A very careful examination was made on the spot by an Inspector, and statements taken from the engine-driver and the learner, which were submitted to the Board, which decided not to seriously punish the driver for not being alongside the learner all the time, because the latter would never gain confidence under those conditions.

In the third case a large single-drum engine was allowed to run away which resulted in the destruction of a good rope nearly 4,000 feet long. The engine was a Fraser & Chalmers 22in. diameter and 48in. stroke fitted with very efficient Whitmore gravity brakes.

At the instance of the Board of Examiners a Board of Inquiry was appointed by the Hon. the Minister for Mines, under Section 64 of the Act, consisting of the Warden, an Inspector of Mines, and the Inspector of Machinery. Evidence was taken on oath, and a report sent to the Board of Examiners which advised the Minister to reduce the accused's status from winding engine to 2nd class engine-driver, which was done.

Three men were reported for allowing boilers to be short of water until the fusible plugs melted, and one for leaving his job and the boiler unattended at a few minutes' notice.

RETURN No. 7.

Engine-drivers and Boiler Attendants' Board Matters, 1929.

Examinations in Perth 4, Kalgoorlie 2, and Bunbury 2.

Examination advertised for Southern Cross, Mt. Magnet, Leonora, Geraldton and Albany, not sufficient candidates.

Eight days spent on actual examinations by Travelling Board.

Twenty-five days spent in Perth dealing with applications for Competency Certificates, examination papers and inquiries, etc.

Ten days spent in travelling and looking into matters connected with engine-drivers and boiler attendants.

Two hundred and ten applications received; 179 certificates granted.

Revenue received, £225 10s.

RETURN No. 8.—SHOWING TOTAL NUMBER OF ENGINE-DRIVERS AND BOILER ATTENDANTS' CERTIFICATES (ALL CLASSES) GRANTED IN 1929, COMPARED WITH 1928.

Class of Certificate.	Number Granted.	
	1929.	1928.
Winding Competency, including certificates issued under Regulation 40 and Section 60 of Act	3	2
First Class Competency, including Certificates issued under Regulations 40 and 45, and Sections 60 and 63 of Act	8	6
Second Class Competency, including Certificates issued under Regulation 40, and Section 60 of Act	26	29
Third Class Competency, including Certificates issued under Regulation 45, and Sections 60 and 63 of Act	25	26
Locomotive Competency	8	7
Traction Competency	6	1
Internal Combustion Competency	13	13
Crane and Hoist Competency	13	14
Boiler Attendant Competency	61	53
Interim	2	1
Copies	9	4
Transfers	5	2
Totals	179	158

DIVISION VI.

General.

Through still being short handed every Inspector has been working at high pressure during the year, and although all boilers had been inspected by early in the new year sufficiently to be certificated, not many working inspections could be made; nor could machinery be revisited after repairs and guarding had been ordered, and said to have been done by the owners. This is a great pity, particularly in the case of boilers, because otherwise the Inspector has no means of knowing whether a boiler is really safe or not. It may have perfectly good safety valves, but he cannot know whether they are in proper adjustment, and they may be overloaded to a dangerous extent without being discovered. With boilers working up to the limit of authorised working pressure, the safety valves may often relieve pressure and so remind the attendant or engineer that all is well, but in many cases the pressure required is very much lower than the condition of the boiler would permit, and to which the safety valves are adjusted. The danger in such cases is that the valves get jammed through disuse, so that if by any chance there should be a rise of steam it might reach a very dangerous point and end in disaster. To make time for such inspections merely means that internal examinations must be more hurried, and I could not permit Inspectors to do that.

The work for the Standards Association of Australia has been carried out mainly out of office hours by you, me, and the Senior Inspector. Thirteen nights for the "Power Boilers and Unfired Pressure Vessels," six for "Lifts," and two for "Cranes and Hoists." In February of the year I was deputed to attend the Annual Meeting of the Association in Sydney as a West Australian representative for the the three sections mentioned above in which we are interested. Two meetings were held in Sydney and one at Newcastle. Apart from the Standards work I had the opportunity of meeting the Heads and Senior Officers of Inspection Departments of the other States, and thus able to gain much inside information of problems and practice for comparison with our own. On the return journey I spent two days in Melbourne and two in Adelaide, and was treated with the utmost courtesy and kindness by all the Heads I approached. It was found that our system of inspection and keeping of records was as good as some of the other States, and superior to others—and the qualifications of our Inspectors as good as any. We are a little out of date with our Lift Regulations, but this section has made such rapid strides in recent years that that was not to be wondered at, and can be easily rectified. It should be noted, however, the difference was not in the matter of safety devises but increased speeds, and these have not been pressed until very recently for future, not present, installations.

Revenue and Expenditure.

Return Nos. 9 and 10 show that our revenue was £5,468 1s. 8d., and expenditure £5,341 7s., a small credit balance obtained by very strict economy.

Mileage.

Return No. 11 shows that although the number of inspections was increased by 258, the number of miles travelled was about 1,900 less than last year—five and a half miles per inspection against six last year. This good result was due to more careful study of the arrangement of work by the touring Inspectors.

Staff.

Towards the end of the year Mr. Inspector Stone was granted Long Service Leave after many years of faithful service, and Mr. R. W. Frankish transferred temporarily from the Railway Department to fill the vacancy. He had been a candidate at the last examination for Inspectors of Machinery, and therefore known to the Examining Board.

All members of the staff have worked loyally and well during the year, and to them my thanks are due. They pull together and thus make for efficiency all round.

I am grateful to all those officers of the Crown Law, Police, and Postal Departments scattered throughout the State for generous assistance in carrying out the administration of the Act, and to you for your ever ready help and guidance.

I have, etc.,

B. PRYNN JONES,
Deputy Chief Inspector of Machinery.

11th March, 1930.

RETURN No. 9.—SHOWING ANALYSIS OF REVENUE (ALL SOURCES) FOR YEAR ENDED 31ST DECEMBER, 1929.

Sources.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals.	
			1929.	1928.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Boilers	1,902 16 3	555 0 0	2,457 16 3	2,426 4 3
Machinery	2,416 19 9	289 13 0	2,706 12 9	2,368 14 9
Incidentals	75 9 8	2 13 0	78 2 8	126 14 9
Engine Drivers	...	...	225 10 0	205 13 6
Totals—1929	4,395 5 8	847 6 0	5,468 1 8	...
1928	4,111 5 3	810 8 6	...	5,127 7 3

Increase—£340 14s. 5d.

RETURN No. 10.—EXPENDITURE FOR YEAR 1929 AS COMPARED WITH 1928.

—	1929.	1928.
	£ s. d.	£ s. d.
Salaries	4,496 19 1	4,688 4 2
Incidentals	766 5 10	735 4 2
Engine Drivers	78 2 1	51 10 7
Totals	5,341 7 0	5,474 18 11

Decrease—£133 11s. 11d.

RETURN No. 11.—SHOWING DISTANCES TRAVELLED, NUMBER OF INSPECTIONS MADE, AND AVERAGE MILES TRAVELLED PER INSPECTION FOR YEAR ENDED 31ST DECEMBER, 1929.

—	Rail Miles.			Road Miles.			Water Miles.			Total Miles.			Total Number Inspections.			Average Miles per Inspection.		
	1929.	As compared with 1928.		1929.	As compared with 1928.		1929.	As compared with 1928.		1929.	As compared with 1928.		1929.	As compared with 1928.		1929.	As compared with 1928.	
		Increase.	Decrease.		Increase.	Decrease.		Increase	Decrease		Increase	Decrease.		Increase.	Decrease.		Increase.	Decrease.
Districts worked from Perth	3,527	...	4,148	31,671	3,606	...	62	12	...	35,260	...	530	6,795	298	...	5·18	...	·32
Districts worked from Kalgoorlie	...	...	...	5,895	...	1,355	...	...	...	5,895	...	1,355	613	...	40	9·61	...	1·49
Totals ...	3,527	...	4,148	37,566	3,606	1,355	62	12	...	41,155	...	1,885	7,408	298	40	5·55 = Average all Districts, 1929. 6·01 = Average all Districts, 1928.		
Increases or Decreases ...	Decrease 4,148			Increase, 2,251			Increase, 12			Decrease, 1,885			Increase, 258			Average decrease = ·46 miles per inspection.		

DIVISION VII.

Annual Report of the Chemical Branch, Mines Department, for the Year 1929.

The Under Secretary for Mines, Perth.

Government Chemical Laboratory,
Perth, 14th February, 1929.

I have the honour to submit, for the information of the Hon. Minister, my report on the work of this Branch during the year 1929.

Staff and Equipment.

The technical staff remained at the same strength as in the previous year, viz., five in the Food and Drugs Section, six in the Mineral Section, and six in the Agriculture and Water Supply Section. All possess the qualifications of the Australian Chemical Institute, of which one is a Fellow, and the others Associates.

In accordance with modern practice, and to avoid as far as possible the use of local coal gas, which during the past twelve months, has been of very bad quality for our work, our gas heating units have been largely replaced by electrical ones, and the whole electrical installation overhauled and renovated.

The experimental flour mill is on its last legs and will need to be renewed at a cost of about £350.

Materials Examined.

During 1929 the total number of samples received was 5,235, an increase of 904 over last year. Their source and distribution among the different sections of the laboratory are shown in the following table:—

—	Food, Drugs and Toxicological Section.	Mineral Section.	Agriculture, W. S. & S. Section.
Department of Agriculture ...	49	...	192
Department of Mines	147	2,079	28
Department of Health	123	...	...
Department of Public Works ...	8	2	51
Department of North-West ...	...	3	...
Chief Secretary's Department ...	5	...	...
State Hotels Department ...	11	...	...
Forestry Department	1	...	23
Police Department	160	...	...
Royal Agricultural Society ...	...	...	72
Government Tender Board ...	43	...	6
Government Tramways	2	...	...
Workers' Homes Board	...	5	...
Main Roads Board	...	...	2
Controller of Prisons	...	...	2
Perth Hospital	1	1	...
Metropolitan W.S. & S.	9	22	1,350
Public Pay	19	88	252
Public Free	13	448	18
	591	2,648	1,996
Grand Total	...	5,235	

The most numerous samples are those sent in for gold assay, 1,653 in all, of which 797 were for the State Mining Engineer, mostly bore cores, and 508 for the Superintendent of State Batteries. Water samples numbered 1,387, the majority being for the Metropolitan Water Supply. 511 mineral determinations were made. Other samples numbering over 50 were: Alunite, 138; fertilisers, 85; iron ores, 62; lime, 63; manganese ores, 169; milk, 72; mine air, 101; sewage, 128; soils, 102; tin ores, 97; toxicological specimens, 115; wheat, 92.

Toxicology.

The number of specimens submitted for examination for poisons, viz., 115, constitutes a record. These originated mostly from cases of suicide or attempted suicide, or were viscera from autopsies, where the cause of an unattended death was not clearly indicated. Probably because of its being so easy of access, lysol claimed the larger number of victims.

In view of the wide-spread use of lead arsenate as a spray for growing fruit and green vegetables, one wonders if this dangerous poison is not responsible for much of the gastric troubles so prevalent in parts of the metropolitan area at times. In Queensland it has been found necessary to wage a vigorous campaign against the sale of cabbages and other green vegetables carrying dangerous doses of lead arsenate, up to 17 grains in a single head. In one case an ordinary helping of boiled cabbage was calculated to contain 0.25 grain of lead and 0.37 grain of arsenic oxide.

Foods.

The new Food and Drug Regulations, adopted by an interstate conference of health officers and trade representatives, came into force in this State on the 1st February, 1929. Already applications by manufacturers for amendments of these have been submitted for consideration, including the authorisation of (1) a dilution of a dried vanilla concentrate for sale as a "genuine essence of vanilla"; (2) the use of an emulsified petroleum fraction (alboline) for spraying dried fruit; (3) the use of water-soluble carbohydrates other than lactose in infants' food; (4) the addition of commercial glucose to ice cream.

The Food Standards Advisory Committee has a decided *inter alia* to recommend that the standard for potassium bitartrate should be raised from 95 to 99 per cent. pure, as plentiful supplies of that grade of salt are actually on the market.

In addition to 49 cows milks and 23 human milks, forty-six samples of foodstuffs were submitted for examination, mostly by the Health Department. These included butter, cheese, chutney, cream, cream of tartar, egg pulp, essence of lemon, fish, flour, honey, margarine, meat, potatoes, sago, salt, sauce, and tea. Fourteen of these samples, *i.e.*, 30 per cent. of them, did not comply with the regulations under the Health Act.

Drugs.

Sixteen drugs were received for analysis. One package, the contents of which, under the name of "Herbolo," were advertised as a rapid and sure cure for gallstones, was found to contain three enclosures, one of which was to be taken on each of three successive days. The first proved to be an ounce of senna leaves, the second the same, and the third, six ounces of olive oil coloured with an aniline dye. This package was obviously of no value for the purpose stated, and was being sold at ten times its intrinsic value. The vendor was prosecuted and fined £20, in default 60 days imprisonment with hard labour.

Some tablets advertised as a cure for blood pressure were found to consist of citrate of iron and quinine, sugar coated.

Metropolitan Water Supply.

The Advisory Committee, of which I am a member, has met at regular intervals, and considered questions involving the maintenance of a chemically and bacteriologically pure water supply, as well as minimising the corrosion of pipes, with its consequent discolouration of the water. Mr. H. E. Hill, of this Branch, has continued to act as investigating chemist, and has done much to reduce the corrosion, besides investigating abnormal conditions occurring from time to time.

Liquid chlorine and freshly burnt lime are used regularly at the sources of supply, the former to sterilise the water, the latter to reduce its corroding power. A successful endeavour was made to raise the pH figure of the water in the Churchman's reservoir by broadcasting lime from a boat.

Consideration has also been given to the available sources of further supplies, which will soon be urgently needed.

Tender Board.

Meetings of the Oils Committee have been attended and a number of lubricating oils, motor spirits and power kerosenes analysed as a basis for allocating contracts and checking supplies. A supposed pure neatsfoot oil was found to contain 33 per cent. of a mineral oil.

Mine Air and other Gases.

In the early part of the year Mr. J. C. Hood spent six weeks at Kalgoorlie analysing samples of mine air taken after blasting with various types of explosives. As will be seen in Mr. Stacy's report hereunder, no dangerous concentration of carbon monoxide was observed after firing gelignite, but several cases occurred with blasting gelatine and gelatine dynamite.

On his return journey to Perth he investigated some sewage installations in certain buildings at Northam of which complaints were made that they were giving off gases of an injurious nature, apparently ammonia and amines.

The air of a few of the more remote chambers in our south-western limestone caves is obviously foul, and a sample taken in the Moondyne cave disclosed such a deficiency of oxygen as to be asphyxiating to anyone remaining there for long.

Feeding Stuffs Act.

The amended Act has been in operation since 10th December, 1928. The only standards laid down by regulation are for bran and pollard, largely used as food for dairy cattle and poultry. Twenty-one samples were submitted, 11 of pollard and 10 of bran, for comparison with the standards. Most of the brans were very satisfactory, but a high proportion of the pollards were adulterated with finely chipped bran, giving an excessive figure for fibre and ash, and a product which would not all pass a 24 mesh silk screen as required. Such material has not the same food value as a pollard conforming to the official standard.

Fertilisers Act.

The new Fertilisers Act came into force on the 1st November, and with it the accompanying regulations which were drafted in amplification principally of the chemical requirements of the Act. This Act differs in many details from the old Act which it supersedes and on which it is a great improvement.

The fertiliser samples analysed continue, except in rare instances, to be well up to their guaranteed strength. No deficiency has been noticed in any superphosphate, which is by far the most important fertiliser on the market.

Cattle Disease at Denmark.

A disease causing a high mortality amongst young dairy cattle at Denmark was the cause of our making several analyses of pastures, blood, etc. As the disease was still defying all attempts at control, late in the year a departmental committee was formed to investigate it thoroughly. This comprises the Director of Agriculture, Chief Inspector of Stock and myself. On the chemical side a systematic investigation is to be made of the local stock waters, soils, pastures, and blood of affected animals, and experiments made with various chemical licks and vermifuges.

Bore Cores.

The Mines Department has continued boring in several parts of the State, and a large number of assays for gold have been the immediate result. At Coodardy, boring on the Big Bell G.M. has continued to yield good values over a wide zone of impregnation, with certain sections quite rich, *e.g.* 1oz. 1dwt. 19grs. over 5ft. 8in. alongside 15dwts. 11grs. over 8ft. 4in. A considerable accumulation of pyrrhotite was observed between 516 and 523 feet in the No. 5 Bore. This section was assayed with the following results: sulphur, 11.47 per cent.; nickel, trace; gold and platinum, nil. Bores on the adjacent Little Bell G.M. were disappointing, only two assays over 4dwts. being recorded.

Cores for assay were also received from bores on Crown land at Norseman, Carbine, Bamboo (Kitchener G.M.), Lalla Rookh (Lalla Rookh North G.M.), and Leonora (Harbour Lights G.M.). With the exceptions of short lengths from Norseman and Leonora, these cores yielded long lists of "nils" when assayed for gold.

Boring for lead on M.L. 291 at Braeside yielded 7ft. 4in. of core averaging:—Pb, 48.63 per cent.; Zn, 5.51 per cent.; Ag, 1oz. 6dwts. per ton; Au, nil. The lead was present as galena, and the zinc as blende.

Boring at Eradu disclosed two seams of subbituminous coal, one 14 feet showing 46 per cent. of combustible matter; one of 7 feet 6 inches showing 53 per cent.; the balance being ash and water.

Examination of Mineral Deposits.

In August a few days were spent at Holleton examining the tin deposits. Although there are a number of albite pegmatites invading an Archaean greenstone, only one of them, that known as Mollers, appeared to carry any appreciable quantity of cassiterite, a single crushing of 32 tons from this vein yielding metallic tin at the rate of 1.4 per cent. Several small shafts had been sunk on pegmatite veins, and a few pounds of cassiterite recovered also from the surface soil, but no attempt had been made to test the alluvium systematically.

A sample of albite pegmatite had been received at the laboratory, which yielded 0.6 per cent. of a concentrate, consisting of equal amounts of garnet and tantalite. In consequence a careful search was made for tantalum minerals, in recent years more valuable than tin, but none was found. The only heavy minerals, other than cassiterite, observed in the pegmatites were ilmenite, garnet, tourmaline, bismuth and apatite, all in small amount, and all valueless.

A visit was also made to the "Radium Mine," a few miles east of Holleton. This was a small open cut on an albite pegmatite at a point where it was brecciated and impregnated with biotite. A small proportion (up to one per cent.) of a uranium-bearing xenotime (phosphate of yttrium) can be concentrated from the biotitic portions. The deposit is obviously not worth consideration as a source of radium.

Coming back to Southern Cross I spent two days between there and Nevoria, and was struck by the fact that the pegmatites mentioned so often as occurring in the gold mines of this area are albite pegmatites, often carrying garnet and tourmaline, and thus resembling the typical tin and tantalum "lodes" of many parts of the State. A search for tin and tantalum in this area would be amply justified.

The Senior Mineralogist and Chemist (Mr. Bowley) spent a few days at Balingup, in connection with our ceramic researches, investigating the felspar veins there. His report forms an appendix to this document.

New Mineral Records.

For many years there have been rumours of the occurrence of blue asbestos (fibrous riebeckite) in the North-West Division. Of considerable economic importance is the definite location of this mineral *in situ* at several points in the Hamersley-Ophthalmia Range, from Mt. Margaret on the west to Willi Wolli Springs on the east. Samples brought to Perth are of excellent quality for industrial purposes. The Department has been informed that the longer fibred mineral should bring £85 to £100 a ton.

A copper telluride has been known to occur in small quantities at Kalgoorlie, but its identity has not been established until this year, when Mr. Murray of this Branch proved it to be similar to weissite, a mineral previously found only in Colorado.

Another Kalgoorlie mineral, collected by Mr. Feldtmann of the Geological Survey, proved to be anhydrite (calcium sulphate), a mineral not previously known in Australia.

Mr. Bowley refers to other notable mineral finds under Section II.

Mineral Resources Pamphlet.

The pamphlet originally prepared by me for the British Empire Exhibition, after being completely revised and extensively rewritten, was published early in the year by the Government Printer.

EDWARD S. SIMPSON, D.Sc., B.E., F.A.C.I.,
Government Mineralogist and Analyst.

SECTION I.—TOXICOLOGY, FOODS AND DRUGS.

By C. E. Stacy, A.A.C.I.

Five hundred and ninety-one samples were examined during the year, a decrease of 45 over last year. A notable increase of milks examined may be observed, 49 as against 9 for the previous year, whilst a similar number of human milks as last year have been analysed. Forty-six other samples of food have been examined.

Toxicology.—No fewer than one hundred and fifteen toxicological exhibits have been submitted, another heavy advance over previous years. This work is becoming more and more onerous. Forty-six positive results were obtained, the overwhelming majority being lysol. This liquid is not a scheduled poison, and is easy to obtain. It is hard to see how the authorities can check its improper use, as if it were put on the poison list some other phenoloid substance might be used in place of it, and we must use disinfectants of this nature. Still, it seems somewhat absurd that a person must sign the poison book and have an independent witness if he wants to get a little strychnine to poison a dog, when other poisons are so readily procurable. Cyanide, at any rate on the goldfields, is as easily got as lysol.

Many people send in exhibits of animals, often in a high state of putrefaction, which they believe to have been poisoned. Rarely do they go to the police or a veterinary surgeon for advice, and often they are prepared to pay a high fee for an analysis which is more than often negative. On the other hand, many people think a fee of a guinea sufficient to cover a complete analysis which may take a week or more. In any case poison, if found, would not lead to the detection of a criminal unless other evidence is produced.

While on the subject of poisons I would like once more to draw the attention of the medical profession to the necessity of placing exhibits in separate clean glass vessels, otherwise satisfactory analysis is impossible.

Ales and Stout.—Thirty-four samples have been examined and found to be generally satisfactory.

Under the present regulations the use of salicylic acid has been prohibited, and only benzoic acid and sulphide dioxide are allowed. The latter tends to impart an unpleasant flavour to the beverage. The former, which is more widely used, requires a rather long and complicated examination, so that the time for analysis of a sample of beer or stout for preservatives is prolonged. The amount of salicylic acid formerly allowed could be ascertained in about twenty-four hours.

Whisky.—Eleven samples have been examined, generally for weakness in spirit strength. It is now some years since genuine standard spirits (whiskies and brandies, rums and gins) have been taken from bond and analysed. These liquors naturally show some alteration in character from year to year, and it seems desirable that an examination of liquors in this direction should be put in hand for comparison with spirits on the retail market.

Honey.—Four samples of honey were found to be unusually low in iron content.

Salt.—Seven samples of local salt contained sodium chloride varying from 91.84 to 98.95 per cent.; only two were suitable for human consumption without recrystallising.

Essences.—Three samples submitted conformed with the Food and Drug Regulations, whilst two failed to do so.

Cream of Tartar.—Two samples were found to comply with the regulations, and one tartaric acid failed.

Self-raising Flours.—Two samples examined were satisfactory, whilst two failed to reach the standard.

Cheese.—Two samples examined were satisfactory.

Summer Drinks.—Two samples submitted did not conform with the regulations.

Drugs.—Two quack medicines were exposed as expressing extravagant claims, and in one case a prosecution followed and a fine of £20 was imposed.

It would be as well for the public if more of these quack medicines were seized and their deficiencies disclosed.

Oils.—Thirty-one samples, mostly for the Tender Board, have been tested. Two samples of castor-oil submitted by the Tender Board failed to pass the specification laid down by the Oils Committee in regard to the acidity number, one sample containing 2½ times as much acid as the amount allowed under the specification.

Out of the three samples of neatsfoot oil submitted for tender, two passed the standard. The remaining oil contained a large quantity of unsaponifiable matter which was no doubt a mineral oil adulteration.

Of the four samples of power kerosene representing the common brands on the Western Australian market, two were found to be similar in distillation range and would be consequently of equally good value in service, whilst the other two were of a less useful nature.

Explosives.—Forty-one samples have been tested. These analyses include estimations of density, moisture, complete analysis, and in a number of cases examination of fireworks to ascertain if any have potassium chlorate in admixture with sulphur, which constitutes a danger of explosion to those using them, and which is prohibited by regulation.

Mine air and air samples generally.—One hundred and one samples were received and tested. The majority of these samples were analysed at the School of Mines, Kalgoorlie, by Mr. J. C. Hood, an officer of this section assisting the Chief Inspector of Explosives in an investigation of mine air after blasting with various types of explosives. In no instance did the air in samples taken 20 minutes after firing with gelignite contain quantities of carbon monoxide in concentrations above the maximum safe concentration of 0.04 per cent. This figure was exceeded, however, in two cases with blasting gelatine, and in seven cases with gelatine dynamite. The results are shown in the following table.

ANALYSES OF 89 SAMPLES OF MINE AIR TAKEN AT KALGOORLIE FROM 16TH JANUARY, 1929, TO 20TH FEBRUARY, 1929.

Lab. No.	Particulars of Samples.	Carbon Monoxide CO.	Carbon Dioxide CO_2.	Oxygen.	Nitrogen (by dif.)	Ratio CO. CO_2.
		%	%	%	%	
236	*Chaffers*—While charging 1st round	0·003	0·13	20·74	79·13	1–43
237	After firing 1st round Blasting Gelatine	·004	·05	20·67	79·28	1–12
238	After firing round with Gelatine Dynamite	·012	·15	20·60	79·24	1–13
239	After firing round with Gelignite	·006	·19	20·72	79·08	1–32
240	*Chaffers*—(2,900ft.)—After firing cut with Blasting Gelatine	·036	·36	20·62	78·98	1–10
241	In drive 180ft. from face after firing with Blasting Gelatine	·022	·36	20·62	79·00	1–17
242	After firing easers with Gelatine Dynamite	·019	·24	20·55	79·19	1–13
243	*Perseverance*—After firing 6 holes Blasting Gelatine	·011	·10	20·80	79·09	1–9
244	After firing 5 holes Gelignite	·010	·14	20·80	79·05	1–14
245	After firing with Gelatine Dynamite	·016	·25	20·71	79·02	1–15
246	After firing with Gelignite	·006	·25	20·72	79·02	1–42
247	*Chaffers*—(3,000ft.)—After firing with Blasting Gelatine J. F15	·007	·22	20·88	78·89	1–31
248	After firing 30 plugs Gelatine Dynamite J.F15	*Nil*	·06	20·80	79·14	...
249	After firing round following easers with Gelignite	*Nil*	·08	20·80	79·12	...
250	*Perseverance*—(500ft.)—5 holes with Blasting Gelatine (air through ice and blower)	·010	·27	20·81	78·91	1–27
251	After firing with Blasting Gelatine (air through ice only)	·007	·15	20·82	79·02	1–21
252	After firing 6 holes with Gelatine Dynamite	·001	·08	20·86	79·06	1–80
253	After firing 10 holes with Gelignite	*Nil*	·36	20·74	78·90	...
254	*Chaffers*—After firing 15lbs. Blasting Gelatine	·003	·35	20·72	78·93	1–117
255	After firing easers 3 holes Gelatine Dynamite J.F15	·001	·42	20·71	78·87	1–420
256	While charging 3 holes after easers 30 minutes after firing	*Nil*	·23	20·72	79·05	...
257	After firing 2 holes Gelignite	*Nil*	·15	20·86	78·99	...
258	After firing cut 52 plugs Blasting Gelatine J.F	0·001	0·26	20·79	78·95	1–260
259	After refire cut 10lbs. Blasting Gelatine J.F15	*Nil*	·05	20·83	79·12	...
260	After firing 4 easers 15lbs. Gelatine Dynamite J.F15	·001	·35	20·58	79·07	1–350
261	After firing 3 holes 25 plugs Gelignite, J.F15	*Nil*	·10	20·75	79·15	...
262	*Perseverance*—(500ft.) While charging	*Nil*	·06	20·72	79·22	...
263	20 minutes after firing 16lbs. Blasting Gelatine	·025	·20	20·72	79·06	1–8
264	After firing 20lbs. Gelatine Dynamite	·046	·45	20·57	78·93	1–10
265	After firing 17lbs. Gelatine Dynamite	·046	·52	20·62	78·81	1–11
266	After firing 17lbs. Gelignite	·022	·45	20·71	78·82	1–20
267	*Chaffers*—After firing 15lbs. Blasting Gelatine	·016	·28	20·75	78·95	1–17
268	After refiring cut Gelatine Dynamite (12½lbs.)	·012	·18	20·72	79·09	1–15
269	While charging easers (40 minutes after)	·007	·17	20·65	79·17	1–24
270	After firing 16lbs. Gelignite	·004	·16	20·73	79·11	1–40
271	*Perseverance*—(500ft.)—After firing 10lbs. Blasting Gelatine	·052	·92	20·50	78·53	1–18
272	After firing 15lbs. Gelatine Dynamite	·065	·96	20·33	78·64	1–15
273	After firing 15lbs. Gelignite	·039	1·04	20·32	78·60	1–27
274	*South Kalgurli*—(1,500ft.)—Where men working—45 minutes after shot fired in. Associated.	*Nil*	·14	20·83	79·03	...
1086	12 noon, 10 minutes after firing in Associated, between 2 worst positions on level	*Nil*	·05	20·51	79·44	...
1087	12·15 p.m. on 15 level	*Nil*	·06	20·53	79·41	...
1088	12·30 p.m. on 15 level	*Nil*	·05	20·70	79·25	...
1089	*South Kalgurli*—(1,500ft.)—On top of winze through from Associated	*Nil*	·07	20·85	79·08	...
1090	*South Kalgurli*—(1,500ft.)—30 minutes after firing in Associated	·004	·09	20·64	79·27	1–32
1091	90 minutes after firing in Associated	·001	·07	20·82	79·11	1–70
1092	2½ hours after firing in Associated	*Nil*	·06	20·77	79·17	...
1093	*South Kalgurli*—(1,500ft.)—10·50 a.m.	*Nil*	0·05	20·82	79·13	...
1094	11·45 a.m.	*Nil*	·05	20·85	79·10	...
1095	(Over winze from Associated) 12·10 p.m.	·001	·05	20·75	79·20	1–50
1096	*South Kalgurli*—20 minutes after firing using ¼in. jet	·032	·38	20·74	78·85	1–12
1097	30 minutes after firing using ¼in. jet	·015	·24	20·71	79·04	1–16
1098	After firing 2nd round—20 minutes with ¼in. jet	·054	·95	20·55	78·45	1–18
1099	After firing 3rd round—20 minutes with ¼in. jet	·021	·35	20·60	79·03	1–17
1100	After firing 3rd round—30 minutes with ¼in. jet	·015	·19	20·68	79·12	1–13
1101	*Great Boulder*—(No. 12 level)—After firing 21 plugs Gelignite J.F 15 (sand tamping)	·009	·43	20·57	78·99	1–46
1102	After firing 22 plugs Gelignite J.B. 14 (sand and carboard tamping)	·011	·33	20·52	79·14	1–30
1103	After firing 22 plugs 50 per cent. Gelignite J.F. 14	·011	·25	20·39	79·35	1–23
1104	*Great Boulder*—(No. 15 level)—After firing 17 plugs Gelignite J.F. 15 ; 7½ plugs Gelignite J.B. 14	·012	·56	20·47	78·96	1–47
1105	After firing 33 plugs Gelignite J.B. 14	·031	·83	20·30	78·84	1–27
1106	*Great Boulder*—(No. 12 level)—After firing 50 per cent. Gelignite J.B.	·001	·26	20·69	79·05	1–260
1107	*Perseverance*—(500ft. level)—20 minutes after firing 15lbs. Blasting Gelatine	·075	·75	20·64	78·54	1–10
1108	35 minutes after firing 15lbs. Blasting Gelatine	·014	·19	20·92	78·88	1–13
1109	After firing 6 holes Gelatine Dynamite	·014	·26	20·90	78·83	1–19
1110	Taken while lighting, 1 hour after firing	·008	·19	20·87	78·93	1–24
1111	Taken 30 minutes after firing Gelignite	·013	·28	20·88	78·83	1–22
1112	Taken 45 minutes after firing Gelignite	·009	·16	20·85	78·98	1–18
1113	*South Kalgurli*—(900ft. level)—20 minutes after firing 10lbs. Gelatine Dynamite	·050	·56	20·55	78·84	1–11
1114	30 minutes after firing 10lbs. Gelatine Dynamite	·040	·46	20·67	78·83	1–12
1115	45 minutes after firing 10lbs. Gelatine Dynamite	·022	·30	20·70	78·98	1–14
1116	20 minutes after firing 10lbs. Gelatine Dynamite (¼in. jet)	·029	·31	20·68	78·98	1–11
1117	30 minutes after firing 10lbs. Gelatine Dynamite (¼in. jet)	·021	·27	20·70	79·01	1–13
1118	45 minutes after firing 10lbs. Gelatine Dynamite (¼in. jet)	·002	·05	20·80	79·15	1–25
1119	*Great Boulder*—12 level after 1st round	0·006	0·64	20·72	78·63	1–106
1120	12 level after 2nd round	·009	·58	20·45	78·96	1–64
1121	12 level after 3rd round	·014	·46	20·54	78·99	1–33
1122	*Great Boulder*—15 level while charging face	*Nil*	·13	20·84	79·03	...
1123	15 level after firing 1st round	·014	·21	20·60	79·18	1–15
1124	15 level after firing 2nd round	·009	·17	20·59	79·23	1–18
1125	15 level after firing 3rd round	·017	·29	20·48	79·21	1–17
1126	*Great Boulder*—(1,500ft.)—While charging 1st round on top of winze	*Nil*	·11	20·88	79·01	...
1127	After 1st round on top of winze	·008	·74	20·59	78·66	1·92
1128	After 2nd round on top of winze	·008	·38	20·85	78·76	1–48
1129	After 3rd round on top of winze	·010	·85	20·68	78·46	1–85
1130	*Perseverance*—20 minutes after firing 1st round (⅛in. air jet)	·043	·68	20·72	78·56	1–16
1131	30 minutes after firing 1st round (⅛in. air jet)	·021	·38	20·85	78·75	1–18
1132	20 minutes after firing 2nd round (⅛in. air jet)	·052	1·80	20·53	77·62	1–35
1133	30 minutes after firing 2nd round (⅛in. air jet)	·021	·41	20·76	78·81	1–20
1134	20 minutes after firing 3rd round (air through ice)	·019	·63	20·72	78·63	1–33
1135	30 minutes after firing 3rd round (air through ice)	·009	·22	20·82	78·95	1–24

The ventilation conditions of some of the mines being better than others, cause the carbon monoxide to carbon dioxide ratio to show wide divergence even when the various types of explosives are fired under similar conditions. The ratio is constantly lower in the case of the most highly "oxygenised" explosive, namely, gelignite.

The figures indicate the effect of using cardboard and paper tamping as giving rise to larger quantities of the more dangerous carbon monoxide. The following analyses were made to see what effect the composition of the explosive wrappers would have on the "oxygen balance":—

	Parchment wrappers from blasting gelatine.	Paraffined wrappers.	
		A. from gelatine dynamite.	B. from gelignite.
Weight of one wrapper (mean of 6)	grams 3·520	grams 3·594	grams 3·504
	%	%	%
Carbon	39·3	48·8	51·8
Hydrogen	6·1	8·7	8·4
Nitrogen	·7	·5	·4
Oxygen (by difference)	53·9	42·0	39·4

Paraffined papers containing more carbon would therefore require more oxygen for complete combustion, consuming a quantity of oxygen contained in the explosive and tending to the production of more carbon monoxide.

One sample of air from Moondyne Cave, at Augusta, was so deficient in oxygen as to be dangerous if breathed for any length of time by visitors to the cave.

An officer of this section (Mr. J. C. Hood) visited Northam during the year and reported on the "Kaustine" system of sewage destruction in use in some public buildings, where complaints had been made of the injurious character of the gases evolved. The result of his investigations was not altogether in favour of the method as practised there.

Miscellaneous Samples.

Buffalo Fly Exterminator.—An investigation was initiated during the year into the best method of preparing a concentrated extract for transportation to the North-West for spraying purposes. The final result was not completed during the year, but will be fully commented upon in next year's annual report. It may, however, be said that satisfactory progress was obtained.

Galvanised Iron.—Two samples of galvanised iron were examined. These were tested for total thickness; thickness of zinc; weight of zinc; thickness of iron base; impurities in zinc coating, iron, lead, tin and chlorine; carbon in iron base; flexibility of zinc coating; effect of 1 per cent. solution of hydrochloric acid, sodium hydroxide and sodium chloride.

Native Rubber.—A sample of latex was examined during the year, which was obtained from native trees in the Kimberley Division and forwarded from Broome. The coagulum was found to contain 35.45 per cent. of india rubber and 60.53 per cent. of resins and oil. It had but a low commercial value.

Furs and Fabrics.—Three of these were sent in which were alleged to have caused dermatitis in the wearers, but a thorough chemical analysis failed to disclose any substance, such as meta- or paraphenylene diamine, alkalies or arsenic which would tend to cause skin irritation.

Cattle Dip.—Thirty samples were analysed and the content found to be remarkably uniform in arsenic.

Soap and Soap Mixtures.—Thirteen were received and found to be generally satisfactory.

Abattoirs Brine.—During the year Mr. F. E. Chapman, an officer of this section, at the request of the Controller of Abattoirs, investigated the cause of the excessive frothing of the calcium chloride brine in the trays of their refrigerating plant at Midland Junction abattoirs. The cause of the frothing and corrosion was found to be due to insufficient sodium hydroxide in the brine. On the addition of 1 lb. sodium hydroxide to every 40 gallons of calcium chloride brine of specific gravity 1.200 the trouble was removed.

General Comments.—I would still like to see more foodstuffs analysed in this section. At present the amount of miscellaneous work far exceeds such samples.

I should like here to express appreciation of the work of the various officers assisting me in this section. Mr. Malloch has been of great help in toxological work and with milk samples. Mr. Hood has specialised in mine air; Mr. Chapman in oils; and Mr. Allsop has done good work for a portion of the year in which he has been connected with this section.

SECTION II.—MINERALOGY, MINERAL TECHNOLOGY AND GEOCHEMISTRY.

By H. Bowley, F.A.C.I.

During the year 2,648 samples were received from sources shown in the table on page 125.

The section suffered a severe loss by the death of Mr. J. J. Armstrong, Laboratory Assistant, towards the end of the year. Mr. Armstrong, who had an extensive mining experience, as well as an honourable war service, proved during his association with us, to be a thoroughly capable, conscientious and trustworthy officer, and difficulty will probably be experienced in replacing him.

Owing to Mr. Murray's long service leave and my absence on account of sickness synchronising, Mr. J. N. A. Grace had charge of the section from the beginning of the year until my return to office at the end of March.

Mr. C. Bown was employed for six weeks as a temporary chemist.

Gold Assays.—These again accounted for the bulk of the samples submitted, 1,653 being assayed for that metal. Of these, 508 were for the State Batteries Branch, whilst cores from the bores put down by the Government accounted for 881, the balance being mainly assays made under the free assay regulations for prospectors.

Cores were examined from bores put down on the Big Bell G.M., Coodardy, Bores Nos. 2, 3, 4, 5, 6 and 7; Little Bell G.M., Coodardy, Bores Nos. 1, 2 and 3; Harbour Light G.M., Leonora, No. 2 Bore; Lalla Rookh South G.M. and Lalla Rookh North G.M., No. 2 Bore, at Lalla Rookh; Kitchener G.M., Bamboo Creek, Nos. 1 and 2 Bores; Norseman Nos. 1, 2 and 3 Bores and Carbine No. 1 Bore.

In a number of instances, the complete core was forwarded direct to this office. This provides the opportunity to systematically sample and assay the whole of the core, at the same time preserving representative pieces of the core from each section for despatch to the Geological Survey for petrological and other purposes.

This method is to be commended, as it facilitates the determination of the metallic values, for which purpose the bores are primarily put down, enabling an early decision to be arrived at whether it is desirable to continue the bore. It also provides an opportunity to note and record the more important mineral constituents, whilst the information gained proved of considerable assistance in deciding the advisability of assaying similar types of rock from other bores and localities.

As this procedure does not in any way impair the subsequent petrological examination, it could, I am convinced, be continued with advantage in all cases.

Exhibitions.—In order to fittingly celebrate the opening of the Centenary Pavilion at the Royal Show, it was agreed that the mineral industry should be represented by the gold collection in possession of the Government. This valuable collection is vested in the Government Geologist, who at that time, being absent in the Kimberleys, arranged that I should act for him. Although police supervision was generously supplied during the whole period the collection was on view, it could not be displayed to the best advantage, owing to the difficulty of arranging the cases in order to provide reasonable security when dealing with large and closely packed crowds, such as the one present on "People's Day." The exhibit, which includes gold nuggets and telluride specimens of considerable scientific and economic interest, proved a great attraction, as although it has been on display overseas on several occasions, this is only the second time it has been exhibited locally.

Manganese Ores.—A large number of samples taken from the main Horseshoe deposit by the Government Geologist, were assayed for metallic manganese, whilst 49 were examined for manganese dioxide, metallic iron and silica also. In the latter case they ranged from—

		per cent.		
Manganese dioxide, MnO_2	...	66·10	to	80·44
Metallic manganese, Mn	...	45·12	„	55·82
Metallic iron, Fe	...	1·37	„	12·12
Silica, SiO_2	...	·28	„	3·74

Four average samples from different parts of the deposit contained:—

		per cent.		
Cobalt, Co	0·11	0·12	0·13	0·33
Phosphorus, P. ...	0·02	0·03	0·09	0·12

Manganese ores have also been received from—

		per cent.
Halls Creek	Mn,	38·13
652 M.P., Rabbit-proof Fence ...	Mn,	59·26
Wyloo Station, Onslow	Mn,	54·44

Alunite.—The samples of sedimentary alunite taken by the Government Geologist and myself towards the end of 1928 from Chandler Lake, at Campion, have been examined as opportunity offered during the year, and there now only remain a few to complete the examination of this deposit. The results obtained to date are extremely promising and indicate the presence of big quantities suitable for large scale development, particularly owing to its close proximity to a railway and the ease with which it can be recovered from the lake. It is hoped to publish these results early in the year in a pamphlet embodying some further work on the chemistry of the treatment of alunite, with a section on the geology by the Government Geologist.

In passing, it might be noted that parcels of about 20 tons each of this material have been forwarded to the British Aluminium Company, and the American Cyanide Company, for experimental testing.

Tantalite.—Forty-two samples of tantalum bearing ore, ranging from low grade columbite to high grade tantalite, were received for the year. As in the past, the bulk of commercial grade ore came from the North-West Division (particularly Wodgina, McPhee's Range and Tabba Tabba), and Greenbushes. Saleable ore assaying 68 per cent. of tantalic oxide has also been reported as coming from the proximity of Collier Bay, in the Kimberleys. From Gibraltar, where only columbite had been previously recorded, one carrying 60 per cent. of tantalic oxide was forwarded for analysis, whilst two other samples from the same locality assayed 59.7 and 52.8 per cent. of tantalic oxide.

Tantalite has been recognised in small quantities in an albite pegmatite from Holleton.

Bismuth in Lead Ores.—The specification issued by a leading English firm of ore buyers, required that lead ore offered to them shall be free from bismuth. A sample taken from a shipment of lead ore from M.L. 297, "Oakover," 5 miles east of Braeside Station, containing 76 per cent. of metallic lead, gave no reaction for bismuth by a method capable of detecting 0.00002 gms. of that metal. Another sample taken from a parcel of 27 tons from M.L. 287 "Federal," 8 miles north-east of Braeside, yielded on assay—Lead, 78 per cent.; Bismuth, 0.007 per cent.

Coal.—Twenty samples of coal were analysed, of which the following from new localities are of interest:—

Locality:	Lignite Loc. 1036 Lower Blackwood.	Lignite Bibilup.	Brown coal 15m. E. of Stirling Range.
Proximate analysis:	%	%	%
Moisture	11·51	12·87	18·38
Volatile hydrocarbons ...	40·59	37·75	45·35
Fixed carbon	41·75	43·84	29·30
Ash	6·15	5·54	6·97
	100·00	100·00	100·00
Calorific value, B.T.U. ...	8,877	...	...

Sub-bituminous coal from 71 feet in a bore 1½ miles from Wilga Railway Station contained:—

Proximate Analysis:	%
Moisture	13·42
Volatile hydrocarbons	26·13
Fixed carbon	34·65
Ash	25·80
	100·00

Miscellaneous Minerals.

Corundum.—Small parcels of marketable corundum were submitted from north of Dangin, where a systematic search is now being made to locate commercial supplies. This activity has stimulated the search for this mineral in this district and Jacob's Well, it having been previously reported from several localities in the latter district.

Crocidolite (Blue asbestos).—Fibrous riebeckite, known as crocidolite or blue asbestos, has been received from several localities in the Pilbara District. Analyses made of specimens from the vicinity of Mt. Margaret, in the Hamersley Range and Willi Wolli Springs in the Ophthalmia Ranges, which are about 125 miles apart, bear a very close resemblance to one another and establish their identity with the well-known commercially valuable "Cape Blue" variety.

Efflorescence.—A yellow efflorescence from near Callytharra Spring, Wooramel River, supposed to consist mainly of native sulphur, showed a total absence of that mineral. It was a saline efflorescence formed as a result of the oxidation of pyrite or marcasite in a saliferous shale, and consisted of a mixture of minerals in approximately the following quantities: Halite, 13.4 per cent.; Natrojarosite, 10.6 per cent.; Epsomite, 10.3 per cent,; Pickeringite, 7.2 per cent,; Gypsum, 2.8 per cent.; Thenardite, 2.1 per cent.; Coquimbite, 2.0 per cent.; Melanterite, 1.6 per cent.; Copiapite, .8 per cent.; Limonite, .8 per cent; the balance being sand and clay.

A yellow impregnation in sandstone from the same locality was found to be nontronite (hydrous silicate of iron).

Garnet.—Crystals of common garnet up to 10 lbs. in weight have been recorded from near Yabberup, 13 miles east of Donnybrook. The crystals received from this locality in this office were sufficiently large, pure and undecomposed to be suitable for the manufacture of abrasive papers. The deposit appears to be capable of yielding commercial supplies.

Talc.—Some massive talc of very high grade, well suited for use in the paper, rubber and toilet trades was submitted from Mt. Gould. Other samples of commercial talc were received from Mullalyup and Henry River District. There is an appreciable demand in this State for ground talc for the rubber trade, which should be satisfied by the local product.

Weissite.—A copper telluride from the Kalgurli G.M., Boulder, has been analysed by Mr. D. G. Murray, who has also worked out its constitution, which agrees with that for Weissite. The details of his work will be published elsewhere.

Mineral Analyses.—Complete chemical analyses have been made of the following minerals:—Anhydrite, Kalgoorlie; Anthophyllite, Bindi Bindi; Axinite, Yampi; Gahnite, Gillingarra; Hypersthene, Warrambu; Manganotantalite, Gibraltar; Chromiferous Opal, Poona; Fibrous Riebeckite, Mt. Margaret and Willi Wolli Springs; Siderite, Kalgoorlie; Tourmaline (Dravite), Greenbushes; Weissite, Boulder.

Ceramics.—Seven clays of widely different types have been investigated to determine their suitability for use in the ceramic industries.

An examination of a number of roofing tiles, locally manufactured from a mixture of sand and cement and surfaced with an inert colour, proved them to possess a lower speed of absorption of water than the clay product, whilst the highest figure for water absorbed per cent. of tile was less than half that of a local clay tile.

SECTION III.—AGRICULTURE, WATER, AND SEWERAGE.

By A. J. Hoare, A.A.C.I.

The total number of samples entered for examination this year is 1,996, a decrease of 38 on the total for the previous year. Their sources are shown in the table on page 125.

Soils.—Of the 102 soils received, 48 were submitted by the Agricultural Department in connection with the 3,500 farms scheme, and of the balance 20 were received from the Forestry Department's pine plantations.

Of the 48 soils received from between the Great Southern and Esperance railways in connection with the 3,500 farms scheme, all were analysed for total water soluble salts (or, as returned in some countries, "alkali"). These water soluble salts ranged from 0.147 per cent. for a surface soil, representing 20 sites examined, to 0.989 per cent. for a sub-soil taken at a depth of 12-24 inches.

Twenty analyses were made to determine the composition of the soluble salts, examples of which are as follows:—

1·5 WATER EXTRACT ON STEAM-DRIED SAMPLE.

——	Parts per million.	
Lab. No.	4,605	4,611
Sample No.	2	11
Chlorine, Cl	1,250	3,840
Carbonate, CO_3	...	45
Bicarbonate HCO_3	381	351
Sulphate SO_4	282	1,621
Nitrate, NO_3	5	2
Calcium, Ca	39	36
Magnesium, Mg	28	96
Sodium, Na	1,220	3,356
Potassium, K	26	26

Twelve determinations were also made of the total carbonates in the soil and the same number of reactions (pH) were determined, using the Quinhydrone electrodes. The replaceable calcium (Ca), magnesium (Mg), sodium (Na), and potassium (K) were also required in twelve of the soils.

Fertilisers.—There was a slight falling-off of samples received during the year, probably due to the changeover to the new Fertiliser Act which came into force on 1st November, 1929. Regulations were formulated in this Department covering methods of analyses, chemical and physical; also minimum standards for the various constituents of the fertilising materials on the market. The majority of the samples analysed agreed with the guaranteed figures, and in some cases exceeded them.

Fungicides and Insecticides.—The figures found by analysis of the 11 samples received agreed with those of the formulæ supplied by the manufacturers.

Fodders.—At the request of the Agricultural Department samples of dried lexias, sultanas, and currants were analysed to determine their value as stock food. Pasture grasses and silage samples were also submitted by the same department.

The figures for the dried lexias, etc., are as follows:—

Lab. Nos.	2,615	2,616	2,617	2,618
	Lexias.	Sultanas.	Currants.	Buck Currants.
	%	%	%	%
Moisture	25·50	23·40	22·60	23·00
Ash	1·97	2·29	2·18	1·97
Albuminoids	1·45	2·11	1·81	1·70
Sulphuric ether extract	·65	·34	·42	·44
Fibre	1·91	1·30	1·76	1·34
Nitrogen-free extract	68·52	70·56	71·23	71·55
	100·00	100·00	100·00	100·00
Percentages on original samples.				
Calcium oxide, CaO	0·056	0·064	0·092	0·114
Potassium oxide, K_2O	·942	·976	·854	·879
Phosphoric oxide, P_2O_5	·131	·195	·186	·178
Percentages on ash.				
Calcium oxide, CaO	2·85	2·79	4·23	5·80
Potassium oxide, K_2O	47·90	42·59	39·20	44·60
Phosphoric oxide, P_2O_5	6·66	8·52	8·52	9·01
Unit values as fodder (Guthrie's formula)	71·43	73·44	73·99	74·24

Gypsums, Limes, and Limestones.—The quality of the lime used in the treatment of water supplied to the metropolitan area still maintains a good standard. Although there have been some extreme cases, for example 94.26 per cent. free lime and 53.47 per cent. free lime, the average keeps close to 68.0 per cent.

Waters.—Out of a total of 1,387 samples received 1,112 were for the Metropolitan Water Advisory Committee, principally for pH, alkalinity, and dissolved oxygen. Hygienic and complete mineral analyses of the different supplies were also carried out at regular periods. Over 200 waters were also sent in for stock and irrigation purposes, a fair proportion of these being too saline to be of any value. The Department of Works and Labour also submitted regular samples from the Mundaring reservoir and Kalgoorlie reticulation. The quality of the water from the reservoirs and pipe-head dams is consistently good.

Sewage.—All samples of sewage received this year were from the Perth, Fremantle, and Subiaco treatment works. No samples were received from the many private installations in the metropolitan area.

Mineral Deficiency Diseases in Stock.—Very little work has been done in this matter during the year by this section. The matter has now, however, been placed on a more scientific basis and more progress should be made during the coming year.

Flour.—The 12 samples received were for examination as to baking quality.

Bran and Pollard.—The new Feeding Stuffs Act has been in force for over 12 months, and 21 official samples of bran and pollard were submitted by the Agricultural Department. The figures found agreed fairly well with the standards set down.

Wheats.—Four samples of wheat were sent in by private firms for milling test, and the analysis of the flour therefrom. The Agricultural Department submitted 16 for general milling test, five being f.a.q. samples, one from each State; these were milled and a complete analyses made of the flour and ash. The balance were from the experimental plots at the State Experimental Farm, Merredin.

The figures for the five f.a.q. wheats were as follow:—

Lab. Nos.	1315	1316	1317	1318	1319
	W.A.	S.A.	Vict.	N.S.W.	Q'land.
Bushel weight—					
(1) declared ... lbs	62½	62	62	63	...
(2) cleaned ... ,,	62½	61¾	61¾	62¾	64¼*
Moisture† ... per cent.	11·94	12·41	13·23	13·13	13·78
(Weight in grams of 1,000 berries)	42·56	38·96	35·79	39·79	33·16
Products—	%	%	%	%	%
Flour	71·3	71·0	70·8	71·2	71·1
Bran	19·2	19·1	19·3	18·9	19·0
Pollard	9·5	9·9	9·9	9·9	9·9
Flour—					
Moisture	12·28	12·73	12·69	11·97	12·51
Strength	54·50	53·25	54·50	54·75	57·00
Ash	·57	·63	·53	·61	·47
Protein	8·70	10·25	9·10	9·98	12·57
Gluten, wet	25·81	26·04	25·25	28·30	...‡
,, dry	8·23	9·94	8·69	9·77	...‡
ratio	3·14	2·62	2·91	2·90	...‡
Colour	Excellent.	Excellent.	Excellent.	Excellent.	Excellent.

* Bushel weight struck at North Wharf, Fremantle.
† Moisture determined on cracked grain, 1 hour at 130° C.
‡ Gluten dispersed and unable to collect for weighing purposes.

Analysis of the ash of the above wheats:—

Results expressed as percentages on original ash.

——	W.A.	S.A.	Vict.	N.S.W.	Q'land.
	%	%	%	%	%
Ash	1·33	1·47	1·37	1·32	1·36
P_2O_5	32·90	32·92	33·97	32·72	30·81
K_2O	23·69	26·09	26·28	22·22	23·84
MgO	10·53	13·04	12·82	12·35	12·79
CaO	10·53	4·97	4·49	4·32	3·49
Na_2O	7·24	4·97	5·77	8·64	7·56
SO_3	5·92	6·21	5·77	6·17	11·63
Mn_3O_4	1·97	1·86	1·92	1·85	1·74
SiO_2	3·29	5·59	5·77	7·41	5·23
Cl	3·29	3·73	2·56	3·70	2·33
Al_2O_3 Fe_2O_3	·66	·62	·64	·62	·58
	100·02	100·00	99·99	100·00	100·00
Less O = Cl_2	1·48	1·68	1·15	1·67	1·05

NOTE.—Samples ground whole inclusive of impurities.

Royal Agricultural Society Show Exhibits.—The year 1929 being the West Australian Centenary, special efforts were made by the above society to induce wheat growers in the State and Commonwealth to compete in their wheat competition. The total number of entries was 49, including two from New South Wales under Class 1, "Champion Bushel of Wheat (any variety) grown in the Commonwealth." Of these 34 were milled in the experimental mill and prizes awarded according to points given for the different milling and baking characteristics, the balance being rejected after a preliminary examination as to bushel weight and general appearance. The Champion prize was awarded to a sample of Comeback from Three Springs, having a bushel weight of 67¾ lbs., and yielding 71.1 per cent. flour, 11.6 per cent. protein, and 2,314 lbs. of bread per ton of wheat.

Messrs Louis Dreyfus & Co. also presented a trophy for the best bag of white wheat of any variety other than Premier Strong White or Comeback variety. Twenty-three (23) entries were received under this section, and after the preliminary examination 11 were milled and judged as above. The trophy was awarded to a sample of Nabawa from Quairading having a bushel weight of 64¼ lbs., and yielding 72.0 per cent. flour, 9.2 per cent. protein, and 2,224 lbs. weight of bread per ton of wheat.

The milling investigations were carried out by Mr. R. G. Lapsley, B.Sc. (Agr.), A.A.C.I., who also acted as judge in conjunction with Mr. G. L. Sutton, Director of Agriculture, and Mr. E. W. Wilson, miller to the Peerless Flour Milling Co. Tables of the results obtained may be seen at the Laboratory by any person interested in them.

APPENDIX I.

FELSPAR, MICA, AND BERYL-BEARING PEGMATITES OF THE BALINGUP DISTRICT.

By H. Bowley, F.A.C.I.

Three days were spent in September examining pegmatites in the vicinity of Kirup, Mullalyup, and Balingup, which have yielded, or show possibilities of yielding, commercial supplies of felspar, mica, or beryl.

Mullalyup.

Three separate pegmatite dykes have been opened up on Oliver's P.A. 486H, half a mile south-east of Mullalyup Station, in searching for payable muscovite mica. Two dykes were exposed at the southern end of the area: one at the south-east corner and the other, which has been worked to a larger extent, at the south-west corner. Another small dyke was worked at the north-western corner of the area. The two dykes at the southern end consisted mainly of microcline felspar, associated with muscovite mica and quartz; that at the south-western area showing mica sheets up to 4 inches square, which were much wrinkled and weathered. A little albite and tourmaline were showing with the microcline, whilst offshoots from the main dyke consisted almost wholly of quartz and tourmaline. A bulk sample collected from the dumps, consisting mainly of microcline, quartz and muscovite, yielded 0.02 per cent. of concentrates which proved to be a mixture of garnet, ilmenite, zircon, sphene and apatite. No tin or tantalum-bearing minerals were detected. The pegmatite showing on the south-east corner of the area carried some tourmaline, garnet, ilmenite, haematite and beryl as accessory minerals. Muscovite badly stained and wrinkled was obtained in sheets up to 2in. x 2in.

The felspar, showing in the workings in several places on these pegmatites, was invariably associated with varying amounts of quartz and muscovite, it being impossible to obtain any appreciable quantity of clean felspar, or even grade material. A little biotite mica was in evidence in a few specimens picked up at random on this portion of the area. The beryl seen by me came from a pot hole put down near the road on the south-eastern dyke in this P.A. and was too small in size and too scarce to be of any commercial value. Since my visit, however, Mr. Oliver has found beryl crystals up to a pound in weight on the southern portion of his area.

The vein opened up on the north-west corner of the lease differed from those already described, being for the most part quartz and muscovite, only a small amount of microcline being present as well as a little biotite. The muscovite, which was showing at a depth of 3 to 4 feet from the surface, was obtainable in sheets up to 6 inches square, but much weathered and ironstained. A concentrate, equal to 0.20 per cent. of the original material, consisted mainly of garnet, the other minerals being apatite, rutile, zircon, tourmaline and ilmenite.

Kirup.

A pegmatite dyke situated about 2 miles E.S.E. of Kirup, opened up at several places for mica, consists mainly of albite felspar, muscovite mica, quartz and tourmaline, stained in places with manganese oxides. Sheets of good quality muscovite ranging up to 4 inches x 4 inches could be obtained. The felspar showing in the workings was too intermixed with mica, quartz and tourmaline, and too much stained with manganese oxides for it to be of any value for ceramic purposes. A picked piece of the clean felspar contained Na_2O, 9.52 per cent.; K_2O, .80 per cent. A grab sample from the dump for determination and concentration consisted of muscovite, albite, quartz and tourmaline, with 1.15 per cent. of minerals over 3.3 specific gravity, consisting of ilmenite, haematite, spessartite, zircon, and rutile. No tin or tantalum minerals were present, whilst the absence of apatite was noted.

Balingup.

A felspar pegmatite of considerable extent has been opened up on the Ferndale Estate, 4 miles south-east of Balingup. The dyke as exposed is 13 feet wide by 16ft. high at the end of an open cut, 60 feet in length into the hill. The face consists mainly of clean microcline felspar with some muscovite mica and occasional small veins of quartz. A little tourmaline was also showing, but insufficient to seriously affect the value of the felspar for ceramic purposes. An area 10 feet square of felspar free from mica and containing less than one per cent. of quartz was showing in the face. A little albite was associated with the microcline. One bunch or pocket of beryl 2 feet 6 inches long by 2 feet wide was detected in the sides of the open cut. The quartz, like the beryl, showed a strong tendency to segregate and break away. Apatite, zircon and garnet were also noted.

A concentrate, recovered from a sample taken from the dump, of minerals over 3.3 specific gravity amounting to 0.12 per cent. of the original, contained 29 per cent. of oxides of tantalum and niobium, present as an opaque black mineral, but no tin.

This deposit should be capable of supplying large tonnages of felspar suitable for the ceramic industry, as the amount of mica and quartz showing are insufficient to appreciably affect its value for that purpose.

Analyses made of the Balingup felspar in previous years showed, K_2O, 12.18 and 12.56 per cent.; Na_2O, 2.84 and 2.86 per cent.; Fe_2O_3, .09 per cent.

Several wheat sacks containing beryl were lying on the dump at the time of my visit, and resembled that showing in the open cut. It ranged from nearly colourless to light storm grey in colour and was slightly ironstained on the cleavages. No difficulty would be experienced in picking the beryl free from the quartz, felspar and other associated minerals owing to its strong tendency to segregate, the bunches being only loosely held in the pegmatite.

DIVISION VIII.

Report of the Chief Inspector of Explosives for the Year 1929.

The Under Secretary for Mines.

I have the honour to submit, for the information of the Hon. the Minister for Mines, in compliance with Section 45 of "The Explosives Act, 1895," a report on the working of the Department during the year 1929.

The following table shows the quantity of Explosives imported into the State during the year:—

TABLE I.

Importations of Explosives into Western Australia during 1929.

	Quantity. lbs.
Gelignite	337,000
Gelatine Dynamite	405,000
Blasting Gelatine	233,500
Permitted Explosives	47,500
Blasting Powder	107,500
Pellet Powder	100,000
Sporting Powder	1,000
Fuse (Coils)	213,000
Detonators (Number)	975,000

Particulars are given in Table No. 2 with regard to the quantities of the different classes of Explosives imported during the past five years.

TABLE II.

Comparison of Explosives imported into Western Australia during the past five years.

—	1925.	1926.	1927.	1928.	1929.
	lbs.	lbs.	lbs.	lbs.	lbs.
Gelignite	893,650	586,000	663,000	640,000	337,000
Gelatine Dynamite	234,500	380,000	428,000	487,500	405,000
Blasting Gelatine	84,350	103,000	85,000	127,500	233,500
Permitted Explosives	7,500	35,000	40,000	57,000	47,500
Powder, Blasting and Pellet	730,000	92,500	221,250	152,250	207,500
Powder, Sporting	...	...	...	...	1,000
Fuse (Coils)	335,880	204,000	247,280	202,500	213,000
Detonators (No.)	2,756,000	2,360,000	2,269,000	1,480,000	975,000

The importations were in four shipments and on being subjected to tests on arrival, all the explosives passed the official tests, with the exception of one consignment of 50 per cent. Gelignite. This consignment on being subjected to the heat test was found to be somewhat low, with the result that it was retained under observation, and subsequent testing has shown that there has been no more deterioration causing further lowering of the heat test. Accordingly it is being subjected to tests every month and as long as there is no further fall in the heat test, it will be allowed to go into consumption.

A table has again been prepared showing the consumption of explosives of the nitro-compound class in the different industries where explosives are used.

TABLE III.

Distribution and Consumption of Explosives during 1929.

	lbs.	Percentage of Total.
Gold Mining	836,300	74.00
Agriculture and Land Clearing	123,600	10.93
Government Departments, including Railways, Public Works, and Water Supplies	21,700	1.92
Quarrying	101,800	9.00
Lead Mining	1,000	.08
Copper Mining	..	..
Coal Mining	42,500	3.76
Tin Mining	..	..
Asbestos	1,750	.15

Table No. IV. gives a comparison of consumption for the years 1928 and 1929.

TABLE IV.

Distribution and Consumption of Explosives.

	1928.		1929.	
	Lbs.	Percentage of total.	Lbs.	Percentage of total.
Gold Mining	781,450	72·16	836,300	74·00
Agricultural and Land Clearing	198,600	18·34	123,600	10·93
Government Departments, including Railways, Public Works, and Water Supplies	49,700	4·55	21,700	1·92
Quarrying	50,250	4·73	101,800	9·00
Lead Mining	...	...	1,000	·08
Copper Mining	...	...	...	...
Coal Mining	800	·05	42,500	3·76
Tin Mining	1,900	·17	...	...
Asbestos	...	...	1,750	·15

It will be noted from this table that there is a gradual increase in consumption of explosives in connection with gold mining. The only other industry which shows any rise in the consumption being quarrying.

With the advances in mining development which are likely in Kalgoorlie and Wiluna there should be a very distinctive increase in the consumption of explosives in the near future.

The following licenses have been issued during the year for the storage and sale of explosives:—

TABLE V.

Licenses issued during 1929.

For Magazines on Government Reserves	47
For Magazines used by Government Departments	27
For Magazines erected on Private Property	61
Store Licenses for the sale of Explosives—	
Mode (A)	106
Mode (B)	3
For sale of Fireworks only	286
License for the preparation and use of Explosives of Class IV.—Chlorate Mixture	1
Licenses for the importation of Explosives into the State of Western Australia	2

From this table it will be noted that there has been a general increase in the number of licenses issued during the year, this being due largely to the fact that explosives are being more extensively used for agricultural development throughout the State.

Owing to my having been engaged for some considerable time in connection with an investigation in the mines at Kalgoorlie, and to the fact that Mr. Maslin, Clerk in Charge and Sub-Inspector of Explosives, was away on long service leave during the year, the number of inspections of licensed premises was somewhat curtailed. All licensed premises throughout the goldfields areas and a great portion of the wheat belt were inspected. As a result of these inspections it was not found necessary to take proceedings against any person for breaches of the Explosives Act, but the following explosives were destroyed as not complying with the requirements of the Act:—

TABLE VI.

Destruction of Explosives during 1929.

Date.	Place.	Kind and Quantity.	Remarks.
22–4–29	Perth	5 plugs gelignite; 2 boxes detonators	Taken from youth and destroyed.
25–7–29	Menzies	75 electric detonators	Owing to deterioration.
26–7–29	Leonora	2½lbs. gelignite	Owing to chemical deterioration.
26–7–29	do.	2 lbs. gelignite	do. do. do.
28–9–29	Sandstone	2 lbs. blasting gelatine	do. do. do.
4–9–29	Fremantle	60 lbs. gelignite	do. do. do.
4–12–29	Moora	10 lbs. viking powder	Owing to having absorbed moisture.
11–12–29	Geraldton	70 lbs. gelignite	Owing to chemical deterioration.

The following number of tests were made with a view to ascertaining whether the explosives imported into or stored in the State complied with the requirements of the Act:—

Heat Tests	465
Complete Analyses	41
Fuse Tests	136
Examination of Fireworks	43
Velocity of Detonation	122
A.D.C. Tests	35
Miscellaneous	156

No application was received for the authorisation of any new explosives during the year. There were no new reserves for explosives declared during the year, therefore the number remains the same as last year, *i.e.* 59, with a total area of 3,294 acres.

During the year there have been an unprecedented number of accidents in connection with the use of detonators, causing injury to the hands of users. Of the accidents brought under the notice of the Depart-

ment, six occurred in connection with the Group Settlement in the Busselton area and five in the mines at Kalgoorlie.

An investigation and inquiry was made in July with a view to ascertaining the cause of the accidents in connection with Group Settlements.

It was found that the class of detonator being used at the time of each of the accidents reported were No. 6 Copper Tube Fulminate-T.N.T. Composite Detonators, and according to statements made by the injured persons they exploded either while the fuse was being inserted into the detonator, or the fuse with the detonator attached was being pushed into a plug of gelignite.

Wherever it was possible to obtain samples of the explosives being used at the time of the accident they were taken and submitted to severe tests for sensitiveness, and in no instance was it found that the composition in the detonators was over-sensitive and likely to cause a premature explosion if properly handled.

It was impossible to form definite conclusions as to the cause of the accidents from the statements made by the injured persons, but the opinion was formed that they might be due to an insufficient appreciation of, and the lack of attention to detail and precautions in connection with the preparation of charges, possibly owing to an insufficient knowledge of the subject.

With a view to minimising the risk of accidents, and to assist those engaged in work necessitating the use of explosives, a pamphlet has been prepared, and about two thousand copies of this have been distributed.

It is now hoped that the number of accidents in connection with the use of explosives will be reduced to a minimum, as with reasonable knowledge, care and attention to detail in handling or storing explosives as manufactured at present, and which comply with the tests and requirements of the Department, they present very small risks of exploding prematurely.

In 1927 an application was received from the manufacturers to have a detonator known as the Lead Azide Detonator placed on the list of authorised explosives to be imported or manufactured in this State.

After a thorough investigation into its chemical and physical properties as to stability and sensitiveness it was added to the authorised list.

This detonator came into general use in the mines towards the end of 1928, and during 1929 there were a number of accidents reported in connection with its use in some of the mines in Kalgoorlie, but there have been none reported from any of the other mining centres of the State. Statements made by the injured persons indicated that the detonators had exploded whilst sawdust was being removed by gentle tapping, or a fuse was being inserted. The tapping of these detonators with a veiw to removing the sawdust, with reasonable care, which should be used by experienced miners, or the act of inserting a fuse properly, is not sufficient to cause an explosion, and therefore there must have been some other contributing cause which was not apparent after full inquiry had been made.

Samples of detonators taken from boxes in use by the injured persons at the time of the accidents were subjected to very severe tests for sensitiveness, but in no instance was there any indication that it would be possible to explode the detonators under conditions set out by the miners.

Owing to the prevalence of accidents, whereby men were being injured while using this class of detonator, the miners' union at Kalgoorlie made a request to the Minister to prohibit the use of Lead Azide detonators in the mines. As compliance with the request of the miners' union would have meant the prohibition of this detonator throughout the State, and its removal from the authorised list, a suggestion was made to the mine managers and the union officials that, rather than prohibit the use of this detonator, arrangements should be made by the mines to stock and supply, where requested by miners, a number of the straight fulminate detonators, such as were in use in the mines prior to 1914, as it was considered by so doing confidence would be restored and prejudices, if any, overcome in time.

Arrangements have been made accordingly with the agents for Nobels (Australasia) Proprietary, Ltd., to obtain a consignment of straight fulminate detonators such as were in use in the mines prior to 1914 so that they may be supplied to miners where desired, but I do not think the fulminate detonator is as suitable for use in mines where the humidity is fairly high as in those at Kalgoorlie at the present time, as is the Lead Azide detonator, which offers a much greater resistance to moisture absorption from the atmosphere, and there is no evidence to indicate that Lead Azide is more sensitive to friction or concussion than is fulminate of mercury, while it has been proved that the Lead Azide detonator is efficient for the detonation of explosives which have become inert, or which have a low velocity of detonation.

Owing to a prevalent idea among the miners working in the mines at Kalgoorlie that the fumes from the lower grades of explosives were more injurious than those from the higher grade blasting gelatine, a request was made to the Hon. the Minister for Mines by the miners' union to prohibit the use in the mines of any explosive containing less than 75 per cent. of nitro glycerine.

As this contention was not borne out by theoretical data, nor by practical experiments which had been conducted in the mines in the past, and it was considered that the sole use of blasting gelatine in every phase of mining would not be in the best interests of the mining companies nor the miners themselves, it was suggested that a series of experiments should be conducted under practical working conditions, with a view to ascertaining whether any altered mining practices or conditions underground gave rise to the production of larger volumes of the injurious gases from the explosives as being supplied to-day, and the relation and bearing of the rate of detonation on the products of combusion from the different grade of explosives.

The results from this investigation clearly proved that the air at the face where blasting had taken place contained a much smaller percentage of the harmful gas carbon monoxide when the gelignite were used, than when either blasting gelatine or gelatine dynamite was used under normal working conditions.

This was what was expected from calculated data obtained from the percentage composition of the different grades of explosives, and also from figures obtained by previous practical trials in the mines.

It was indicated that the velocity of detonation of the explosive had an important bearing on the production of the more harmful gases produced by blasting. As a result, one of the recommendations made was that explosives of the nitro compound class supplied to the mines should have a velocity of detonation of not less than 1,500 metres per second when determined by the Dautriche method through a column of explosives, 150 millimetres long, at a temperature of 75° F.

The velocity of detonation of all explosives supplied to the mines since the report of the investigation was prepared has been regularly determined, and it is satisfactory to note that it has been regularly maintained at considerably over the suggested figure of 1,500 metres per second.

It is intended to continue to check the velocity of detonation with future consignments, as it is confidently hoped that if explosives with a reasonable velocity of detonation are supplied, and proper care is displayed by the user in loading holes with explosive, and reasonable precautions taken to displace the products of combustion before returning to a face, accidents from fumes will be reduced to a minimum.

I again desire to acknowledge the courtesy of the Commissioner of Police and his officers for the assistance they have rendered the Department during the year.

T. N. KIRTON,
Chief Inspector of Explosives.

27th March, 1930.

By Authority: Fred. Wm. Simpson, Government Printer, Perth.

WESTERN AUSTRALIA.

DEPARTMENT OF MINES.

MINING STATISTICS,

1929.

x 13/30.

MINING STATISTICS TO 31st DECEMBER, 1929.

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EXPLANATIONS OF SIGNS AND ABBREVIATIONS.

Gf. Goldfield.
Mf. Mineral Field.
D. District.
G.M.L. Gold Mining Lease.
M.L. Mineral Lease.
Loc. Location.
L.C. Lode Claim.
Q.C. Quartz Claim.
R.C. Reward Claim.
M.C. Mineral Claim.
M.R.C. Mineral Reward Claim.
M.A. Machinery Area.
Mach. L. Machinery Lease.
P.A. Prospecting Area.
T.A. Tailings Area.
T.L. Tailings Lease.
W.R. Water Right.
S.L. Special License.
N.E.I. Not elsewhere included.

SUMMARY OF MINERAL PRODUCTION.

GOLD AND OTHER MINERALS PRODUCED DURING 1929, AND THE ESTIMATED VALUE THEREOF, TOGETHER WITH A COMPARISON FOR PREVIOUS YEARS, AND THE TOTAL PRODUCTION TO DATE.

DESCRIPTION OF MINERAL.	1929.		1928.		1927.		1926.		Previously to 1926.		Total to date.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£		£		£		£
1. Antimony ... ... (Exported) statute tons	...	...	...	...	...	...	4½	85	89	1,743	93	1,828
2. Arsenical Ore ... ... (Exported) do.	...	...	*	401	*	819	*	347	...	11,858	...	13,425
3. Asbestos ... ... (Reported) do.	255	14,681	12	782	11	304	105	2,728	909	39,543	1,291	58,038
4. Bismuth ... ... (Exported) do.	...	...	...	...	...	...	...	...	11	844	11	844
5. Coal ... ... (Reported) do.	544,719	426,706	528,420	420,145	501,505	407,967	474,819	394,400	7,258,979	4,558,336	9,308,441	6,207,554
6. Copper { Ore ... ... (Exported) do.	129	2,778	100	765	...	...	...	...	80,124	987,019	80,353	990,562
6. Copper { Ingot and Matte (Exported) do.	...	...	...	...	2	101	1	84	13,414	817,979	13,417	818,164
7. Emeralds ... ... (Reported) carats	*	278	*	910	200	421	...	...	...	...	*	1,609
8. Gadolinite ... ... (Reported) statute tons	...	...	...	...	...	...	...	...	1	112	1	112
9. Gold ... (Exported and Minted) fine ounces	377,176	1,602,142	393,408	1,671,093	408,353	1,734,571	437,343	1,857,716	36,271,167	154,070,123	37,887,447	160,935,645
10. Graphite ... ... (Exported) statute tons	...	...	...	...	...	...	...	...	65	696	65	696
11. Gypsum ... ... (Reported) do.	5,289	7,676	4,214	5,425	6,675	9,818	3,918	5,618	8,024	10,034	28,120	38,571
12. Ironstone ... ... (Reported) do.	...	...	...	...	...	...	...	...	57,830	36,695	57,830	36,695
13. Lead (Ore and Concentrates) (Exported) do.	...	...	...	...	...	...	...	...	44,032	508,748	44,032	508,748
14. Lead and Silver Lead (Ore and Concentrates) (Exported) do.	444	7,016	248	4,198	1,413	24,592	4,162	76,741	20,920	381,032	27,187	493,579
15. Lead (Pig) ... ... (Exported) do.	...	...	...	...	...	...	...	...	23,052	628,956	23,052	628,956
16. Limestone ... ... (Reported) do.	...	...	...	...	...	...	...	...	93,706	18,290	93,706	18,290
17. Magnesite ... ... (Exported) do.	...	...	...	...	...	...	...	...	806	1,526	806	1,526
18. Manganese ... ... (Exported) do.	80	230	...	...	30	303	82	503	60	512	252	1,548
19. Mica ... ... (Exported) do.	...	...	...	...	4	536	4	† 8,328	...	1,357	*	10,221
20. Molybdenite ... ... (Exported) do.	...	...	...	...	...	...	...	...	78	865	78	865
21. Pyritic Ore ... ... (Reported) do.	...	...	...	...	...	...	...	...	74,048	45,496	74,048	45,496
22. Silver ... ... (Exported) fine ounces	49,834	5,509	55,554	6,638	49,895	5,829	68,413	8,863	4,403,620	611,345	4,627,316	638,184
23. Tantalite ... ... (Exported) statute tons	24	7,106	11	2,749	17	3,746	24	5,751	...	19,790	...	39,142
24. Tin Ore ... ... (Exported) do.	77	13,432	85	15,002	77	13,316	67	10,450	15,760	1,537,466	16,066	1,589,666
25. Tungsten Ore { Scheelite ... (Exported) do.	...	...	...	...	...	...	...	...	21	2,507	21	2,507
25. Tungsten Ore { Wolfram ... (Exported) do.	...	...	...	...	...	...	...	...	15	1,441	15	1,441
26. Zinc ... ... (Exported) do	...	...	...	...	...	...	...	...	184	5,437	184	5,437
Unenumerated ... ... (Exported)	...	339	...	71	...	114	8	250	...	7,091	...	7,865
TOTAL VALUES	...	2,087,893	...	2,128,179	...	2,202,437	...	2,371,864	...	164,306,841	...	173,007,214

* Weight not stated. † The value stated for Mica is that declared by the exporter at the time of shipment, but later information indicates that it is overstated.

The value of gold is calculated at the fixed price of £4·24773 per fine oz. Sales of gold by the Gold Producers' Association averaged £5·825 per fine oz. for the year 1920, £5·314 for the year 1921, £4·693 for the year 1922, £4·4244 for the year 1923, and £4·65107 for the year 1924. The amounts of £974,504, £590,428, £239,487, £89,158, and £195,629, should therefore be added to make up the actual total value of such gold.

TABLE I.

AUSTRALASIAN MINERAL PRODUCTION.

COMPARATIVE TABLE SHOWING THE OUTPUT OF ALL MINERAL PRODUCTS FROM THE SEVERAL STATES OF AUSTRALIA AND THE DOMINION OF NEW ZEALAND DURING 1929.

DESCRIPTION OF MINERAL.	Western Australia.		NEW SOUTH WALES.		QUEENSLAND.		VICTORIA.		TASMANIA.		SOUTH AUSTRALIA		NEW ZEALAND.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£		£		£		£		£
Antimony (Metal and Ore) ... Statute tons	...	...	25	1,877	...	...	2	23	...	...	...	...	...	...
Arsenical Ore ... do.	...	...	250	6,010	...	...	...	...	...	...	...	...	...	...
Asbestos ... ... do.	255	14,681	...	...	...	...	...	...	...	...	1	40	...	...
Bismuth (Metal and Ore) do.	...	...	3	2,013	...	48	...	...	...	...	...	...	...	...
Coal ... ... do.	544,719	426,706	7,617,736	5,952,720	1,368,745	1,199,599	703,828	813,370	130,291	105,877	...	...	2,535,864	2,535,864
Copper (Ingot and Matte) do.	...	...	176	14,183	3,748	294,188	...	...	...	...	277	22,982	...	...
Copper Ore ... ... do.	129	2,778	...	...	...	...	10	30	8,869	740,985	...	...	...	...
Gold ... ... Fine ounces	377,176	1,602,142	7,496	31,842	9,476	40,250	26,275	111,609	5,597	23,772	1,009	4,289	111,727	474,585
Gypsum ... ... Statute tons	5,289	7,676	10,418	5,916	...	...	13,195	6,000	...	...	95,613	83,661	...	...
Iron ... . do.	...	...	3,911	17,600	...	...	...	...	...	...	847,813	974,985	4,393	21,965
Iron Oxide ... ... do.	...	...	4,753	2,757	...	...	...	...	...	...	...	...	...	...
Ironstone ... ... do.	...	...	...	...	1,236	974	...	...	...	...	...	...	...	...
Lead and Silver Lead do.	444	7,016	285,031	3,032,349	388	9,015	...	...	5,983	13,879	6	127	...	...
Limestone ... ... do.	...	...	69,243	25,966	67,219	29,940	313,700	894,980	68,176	66,597	81,053	30,395	...	...
Magnesite ... ... do.	...	...	8,953	14,161	...	...	27	101	...	...	135	270	...	...
Manganese Ore ... do.	80	230	233	946	...	...	...	...	...	...	...	...	...	...
Molybdenite ... ... do.	...	...	...	46	...	...	...	...	...	...	...	...	...	...
Mica ... ... do.	...	...	3	20	...	...	...	...	...	...	...	...	...	...
Platinum ... ... Fine ounces	...	...	128	1,352	...	...	...	...	...	...	...	...	7	36
Precious Stones	*	278	...	6,669	...	5,410	...	...	...	...	...	11,056	...	...
Tungsten Ores Scheelite Statute tons	...	...	9	813	...	...	...	...	...	...	...	...	...	...
Tungsten Ores Wolfram do.	...	...	14	1,402	20	1,323	...	...	152	18,358	...	...	23	2,613
Silver ... ... Fine ounces	49,834	5,509	4,471	392	52,663	5,792	909	100	864,354	94,560	1,206	131	479,593	52,755
Tantalite ... ... Statute tons	24	7,106	...	...	...	...	...	...	...	...	...	...	...	...
Tin (Ore and Ingot) ... do.	77	13,432	934	191,199	987	114,518	26	3,545	640	130,014	...	...	...	...
Zinc (Spelter and Conc.) do.	...	...	231,237	802,693	...	...	...	...	6,997	185,964	...	...	...	...
Other	...	339	...	2,733,587	...	6,122	...	181,305	...	285,733	...	192,869	...	501,574
Total Value ...	...	2,087,893	...	12,846,513	...	1,707,179	...	2,011,063	...	1,665,739	...	1,320,805	...	3,589,392

* Weight not stated.

In comparing the total value of the mineral output of the several States it should be noted that although Western Australia produces Lime, Limestone, Cement, Shell, Pottery Clay, Ochre, Salt and Pigments, these products are not included in the figures for Western Australia, but are taken into account in other States.

PART I.—GOLD.

TABLE II.

TOTAL YEARLY PRODUCTION OF GOLD, IN FINE OUNCES, AS REPORTED TO THE MINES DEPARTMENT, TO 31ST DECEMBER, 1929.

GOLDFIELD.	DISTRICT.	1929.		1928.		1927.		1926.		1925.		1924.	
		District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley	... ...	...	184·27	...	40·38	...	193·89	...	64·61	...	29·43	...	12·77
Pilbara	Marble Bar ...	2,286·50	2,309·10	1,878·09	1,945·98	1,601·40	2,022·83	1,950·46	2,376·24	2,404·98	2,502·10	1,858·12	2,134·38
Do.	Nullagine ...	22·60		67·89		421·43		425·78		97·12		276·26	
West Pilbara ...	... ...	...	59·55	...	14·35	...	52·84	...	29·19	...	34·95	...	76·45
Ashburton	... ...	...	8·66	...	36·30	...	15·41	...	10·26	...	10·63	...	3·18
Gascoyne	... ...	...	77·86	...	60·27	...	78·63	...	85·21	...	3·37	...	2·46
Peak Hill	... ...	...	1,085·52	...	1,034·28	...	1,689·22	...	2,139·60	...	1,635·65	...	2,113·13
East Murchison ...	Lawlers	348·87	3,766·25	579·51	4,757·99	193·76	6,025·33	450·74	5,335·56	1,254·51	5,398·50	2,453·98	4,896·94
Do.	Wiluna	1,936·15		1,802·94		4,266·87		3,141·63		2,137·66		1,083·97	
Do.	Black Range ...	1,481·23		2,375·54		1,564·70		1,743·19		2,006·33		1,358·99	
Murchison	Cue	1,731·83		2,437·70		2,936·60		4,180·73		2,338·71		1,912·68	
Do.	Meekatharra ...	16,956·59		17,536·86		19,017·04		23,465·84	33,486·74	22,369·37	29,439·22	19,225·14	24,425·20
Do.	Day Dawn ...	1,323·25	23,426·60	495·58	23,636·04	1,473·59	27,886·30	1,505·33		638·68		775·94	
Do.	Mt. Magnet ...	3,414·93		3,165·90		4,459·07		4,334·84		4,092·46		2,511·44	
Yalgoo	... ...	...	2,611·60	...	6,205·94	...	2,394·40	...	6,382·18	...	2,828·36	...	5,611·23
Mt. Margaret ...	Mt. Morgans ...	956·09	32,778·81	2,977·94	35,223·89	3,718·89	36,698·45	4,984·07	43,628·15	4,804·69	41,849·88	5,552·43	43,704·83
Do.	Mt. Malcolm ...	31,266·48		31,043·33		31,563·34		36,826·35		35,445·39		35,839·35	
Do.	Mt. Margaret ...	556·24		1,202·62		1,416·22		1,817·73		1,599·80		2,313·05	
North Coolgardie ...	Menzies	2,752·46	3,750·52	4,542·26	5,774·00	1,436·20	2,054·58	2,139·74	2,471·94	4,211·90	4,549·66	8,252·74	9,509·19
Do.	Ularring ...	571·37		1,036·25		451·00		110·99		...		210·98	
Do.	Niagara	275·72		194·22		14·91		39·08		188·83		197·30	
Do.	Yerilla	150·97		1·27		152·47		182·13		148·93		848·17	
Broad Arrow ...	... ...	...	8,755·59	...	1,189·74	...	7,569·81	...	1,460·49	...	8,242·38	...	2,660·61
N.E. Coolgardie ...	Kanowna ...	516·36	709·01	894·89	1,298·94	2,243·94	2,486·75	5,976·20	6,198·77	5,747·31	5,897·75	4,525·97	4,690·51
Do.	Kurnalpi ...	192·65		404·05		242·81		222·57		150·44		164·54	
East Coolgardie ...	East Coolgardie...	282,386·57	282,550·39	294,785·07	294,954·41	298,858·80	299,255·89	303,933·40	304,036·97	304,891·85	305,769·11	335,480·59	336,098·63
Do.	Bulong	163·32		169·34		397·09		103·57		877·26		618·04	
Coolgardie	Coolgardie ...	2,544·26	3,448·67	4,279·66	6,104·01	4,278·72	5,785·98	3,507·44	5,997·66	7,459·75	10,308·44	7,100·35	10,242·79
Do.	Kunanalling ...	904·41		1,824·35		1,507·26		2,490·22		2,848·69		3,142·44	
Yilgarn	... ...		4,700·81	...	5,337·95	...	9,226·77	...	11,792·22	...	13,296·97	...	8,451·00
Dundas	... ...	...	1,651·36	...	4,340·59	...	2,739·06	...	2,681·68	...	2,601·30	...	3,429·14
Phillips River ...	... ...	...	189·72	...	113·31	...	283·98	...	19·33	...	27·20	...	145·44
* Donnybrook ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...
State generally	... ...	...	...	...	10·20	...	10·20	...	133·39	...	108·33	...	...
TOTAL	Fine Ounces ...	...	372,064·29	...	392,078·57	...	406,470·32	...	428,330·19	...	434,533·23	...	458,207·88
	Sterling Value	£1,580,429		£1,665,444		£1,726,575		£1,819,431		£1,845,780		£1,946,343	

* Abolished 4th March, 1908.

TABLE II.—*Total Yearly Production of Gold, in Fine Ounces, etc.*—continued.

GOLDFIELD.	DISTRICT.	1923.		1922.		1921.		1920.		Previous to 1920.		Total to December 31st, 1929.	
		District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley	... ...	...	30·55	...	5·01	...	49·35	...	...	...	18,020·35	...	18,630·61
Pilbara	Marble Bar ...	2,388·05	2,543·62	2 779·45	3,100·16	2,556·95	2,626·57	3,164·15	4,052·49	125,728·10	204,689·99	148,596·25	230,303·46
Do.	Nullagine ...	155·57		320 71		69·62		888·34		78,961·89		81,707·21	
West Pilbara ...	... ...	...	64·22	...	94·33	...	67·10	...	133·91	...	27,682·09	...	28,308·98
Ashburton	... ...	...	9·24	...	13·57	...	22·31	...	...	...	8,883·24	...	9,012·80
Gascoyne	... ...	...	...	...	1·52	...	7·46	...	...	...	676·54	...	993·32
Peak Hill	... ...	...	1,699·82	...	2,159·89	...	1,078·53	...	1,655·71	...	253,982·58	...	270,273·93
East Murchison ...	Lawlers	4,302·94		4,650·83		3,008·81		2,693·15		907,375·48		927,312·58	
Do.	Wiluna	3,697·11	11,016·41	5,385·30	13,050·62	4,092·30	18,762·26	5,478·99	19,600·25	89,941·66	1,750,453·29	122,964·58	1,843,063·40
Do.	Black Range ...	3,016·36		3,014·49		11,661·15		11,428·11		753,136·15		792,786·24	
Murchison	Cue	4,155·09		4,840·68		7,186·83		9,642·63		366,840·73		408,204·21	
Do.	Meekatharra ...	20,355·91	27,037·53	26,953·23	36,304·33	30,046·77	41,256·53	28,163·45	46,604·07	887,935·53	2,956,838·08	1,112,025·73	3,270,340·64
Do.	Day Dawn ...	850·79		1,114·58		726·80		4,671·54		1,304,522·86		1,318,098·94	
Do.	Mt. Magnet ...	1,675·74		3,395·84		3,296·13		4,126·45		397,538·96		432,011·76	
Yalgoo	... ...	...	7,713·45	...	18,132·49	...	3,579·20	...	2,965·43	...	121,575·48	...	179,999·76
Mt. Margaret ...	Mt. Morgans ...	5,556·38		7,768·38		7,612·89		5,560·87		509,273·15		558,765·78	
Do.	Mt. Malcolm ...	20,301·14	26,876·42	16,811·82	27,649·19	8,364·49	20,803·51	42,800·83	77,335·84	1,603,187·60	2,908,794·23	1,893,450·12	3,295,343·20
Do.	Mt. Margaret ...	1,018·90		3,068·99		4,826·13		28,974·14		796,333·48		843,127·30	
North Coolgardie ...	Menzies	11,278·69		11,650·21		8,034·25		11,468·50		977,340·95		1,043,107·81	
Do.	Ularring	219·18	12,212·93	1,401·44	13,624·14	1,605·06	10,640·08	57·53	12,024·18	287,954·45	1,965,650·37	293,618·25	2,042,261·59
Do.	Niagara	269·14		197·17		345·17		223·26		501,669·54		503,614·34	
Do.	Yerilla	446·01		375·32		655·60		274·89		198,685·43		201,921·19	
Broad Arrow ...	... ...	...	2,740·98	...	3,628·56	...	8,875·01	...	7,445·23	...	479,583·54	...	532,151·94
N.E. Coolgardie ...	Kanowna ...	4,592·90	4,714·51	3,882·13	4,545·10	3,378·29	4,147·98	1,248·14	1,738·80	690,007·99	719,239·87	723,014·12	755,107·99
Do.	Kurnalpi ...	121·61		662·97		769·69		490·66		29,231·88		32,653·87	
East Coolgardie ...	East Coolgardie	369,859·84	370,669·86	375,757·25	376,388·69	378,344·62	378,429·92	401,417·01	401,495·91	17,335,997·17	17,497,203·28	20,681,712·17	20,846,853·06
Do.	Bulong	810·02		631·44		85·30		78·90		161,206·11		165,140·82	
Coolgardie	Coolgardie ...	9,929·81	13,076·81	9,662·68	16,170·54	4,629·54	9,547·74	3,482·79	5,986·43	972,254·13	1,181,773·89	1,029,129·13	1,268,442·96
Do.	Kunanalling ...	3,147·00		6,507·86		4,918·20		2,503·64		209,519·76		239,313·83	
Yilgarn	... ...	...	8,375·97	...	12,793·95	...	19,241·50	...	37,636·51	...	960,979·81	...	1,091,833·46
Dundas	... ...	...	6,357·85	...	8,043·99	...	5,455·77	...	6,541·18	...	607,352·71	...	651,194·63
Phillips River ...	... ...	...	374·58	...	688·75	...	865·75	...	1,422·76	...	85,641·99	...	89,772·81
*Donnybrook ...	... ...	...	...	...	...	...	...	...	...	...	841·76	...	841·76
State generally ...	... ...	...	157·74	...	144·45	...	99·85	...	20·67	...	7,707·11	...	8,391·94
TOTAL	Fine Ounces ...	...	495,672·49	...	536,539·28	...	525,556·42	...	626,659·37	...	31,757,570·20	...	36,433,682·24
	Sterling Value ...	£2,105,483		£2,279,074		£2,232,422		£2,661,880		£134,897,583		£154,760,445	

* Abolished 4th March, 1908.

TABLE III.

GENERAL RETURN.

RETURN SHOWING, FOR THE RESPECTIVE GOLDFIELDS AND DISTRICTS, THE AREA IN SQUARE MILES, LEASES IN FORCE, PARTICULARS OF PLANT, MEN EMPLOYED AND DIGGERS, ALLUVIAL DOLLIED, AND SPECIMEN GOLD AND ORE TREATED, WITH GOLD AND SILVER YIELD, IN FINE OUNCES, AS REPORTED TO THE MINES DEPARTMENT FOR THE YEAR 1929.

Goldfield.	District.	Date of Proclamation of Goldfield.				Area in Square Miles.		Leases in force, 31-12-1929.		Particulars of Plant.					Average Number of Men engaged in Gold Mining.		
										Milling.		Cyaniding.			Men employed.		
		Proclamation gazetted.	To take effect from.	Latest Amendment of Boundaries gazetted.	To take effect from.	Goldfield.	District.	No.	Area in Acres.	Stamps.	Other Mills.	Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	Above Ground.	Under Ground.	Diggers.
Kimberley	...	20-5-86	20-5-86	31-10-02	1-11-02	33,833	...	...	...	...	...	...	...	...	...	...	4
West Kimberley	...	19-3-20	1-3-20	...	...	98,600	...	...	...	...	...	...	...	...	...	...	...
Pilbara	Marble Bar	1-10-88	1-10-88	2-9-27	2-9-27	52,809	25,809	13	100	45	4	10	...	...	16	19	6
	Nullagine						27,000	3	42	8	...	3	...	...	15	5	3
West Pilbara	...	20-9-95	1-11-95	1-3-07	1-3-07	10,843	...	...	...	...	...	...	...	...	...	...	2
Ashburton	...	11-12-90	11-12-90	18-10-01	14-10-01	14,230	...	...	...	...	...	...	...	...	...	...	2
Gascoyne	...	25-6-97	15-4-97	...	...	5,313	...	2	12	...	...	...	...	...	...	...	2
Peak Hill	...	19-3-97	1-4-97	13-11-14	1-12-14	23,650	...	8	75	10	1	9	...	...	15	13	3
East Murchison	Lawlers	28-6-95	28-6-95	2-1-20	1-1-20	26,058	6,691	1	6	20	2	14	...	...	15	...	6
	Wiluna						10,496	57	1,175	23	1	11	...	...	177	128	...
	Black Range						8,871	3	56	15	...	11	...	...	29	31	...
	Cue						8,593	17	330	20	1	17	...	...	61	22	...
Murchison	Meekatharra	24-9-91	24-9-91	28-11-13	1-1-14	25,474	12,250	29	405	60	9	9	...	...	56	121	10
	Day Dawn						896	7	76	...	...	6	...	...	16	7	...
	Mt. Magnet						3,735	8	79	20	6	16	...	...	42	41	2
Yalgoo	...	8-2-95	23-1-95	30-7-15	9-8-15	23,230	...	23	331	34	4	15	...	...	39	40	...
Mt. Margaret	Mt. Morgans	12-3-97	1-4-97	2-1-20	1-1-20	59,918	14,007	4	63	25	6	12	6	1	29	2	...
	Mt. Malcolm						6,018	29	637	65	7	6	4	1	123	210	2
	Mt. Margaret						39,893	11	246	20	2	13	...	...	25	6	...
North Coolgardie	Menzies	28-6-95	28-6-95	7-9-17	17-9-17	13,746	6,805	9	70	15	4	9	...	...	19	15	1
	Ularring						3,093	1	12	20	2	6	...	...	11	6	1
	Niagara						688	4	42	10	...	...	...	...	3	3	...
	Yerilla						3,160	2	27	20	1	9	...	...	7	5	...
Broad Arrow	...	17-11-96	20-11-96	8-6-06	1-7-06	1,038	...	14	219	20	20	9	7	3	85	73	10
North-East Coolgardie	Kanowna	20-3-96	15-4-96	27-3-08	1-4-08	20,604	1,094	1	2	5	3	4	...	...	19	15	3
	Kurnalpi						19,510	...	...	5	1	...	...	...	8	8	1
East Coolgardie	East Coolgardie	21-9-94	1-10-94	27-3-08	1-4-08	1,800	810	80	1,185	105	154	16	90	38	876	1,136	36
	Bulong						990	1	12	...	...	...	...	...	14	8	2
Coolgardie	Coolgardie	6-4-94	6-4-94	1-3-07	1-3-07	11,702	9,384	20	295	45	5	26	...	...	70	51	10
	Kunanalling						2,318	2	28	25	2	8	...	...	13	14	...
Yilgarn	...	1-10-88	1-10-88	4-2-21	4-2-21	17,200	...	25	388	58	4	21	...	...	95	57	...
Dundas	...	31-8-93	31-8-93	1-3-07	1-3-07	11,430	...	14	206	25	4	13	...	...	32	33	...
Phillips River	...	21-9-00	14-9-00	28-1-16	1-2-16	5,078	...	2	36	30	...	4	...	...	15	4	...
State generally	...	...	...	...	...	...	...	2	30	...	...	...	...	...	3	1	...
	Total	...	...	...	...	456,556	..	392	6,185	748	243	277	107	43	1,928	2,074	106

TABLE III.—*Return showing for the respective Goldfields and Districts, etc.*—continued.

Goldfield.	District.	1929 GOLD AND SILVER YIELD—DISTRICTS.						1929 GOLD AND SILVER YIELD—GOLDFIELDS.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.
		Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley ...	...	...	...	...	...	...	...	184·27	...	...	...	184·27	...
Pilbara	Marble Bar ...	12·67	18·95	1,403·00	2,254·88	2,286·50	40·00	12·67	29·94	1,403·30	2,266·49	2,309·10	40·00
Do.	Nullagine ...	...	10·99	·30	11·61	22·60	...						
West Pilbara ...	...	...	...	...	...	...	...	53·99	...	...	5·56	59·55	...
Ashburton ...	...	...	...	...	...	...	...	8·66	...	...	...	8·66	...
Gascoyne	...	...	...	...	...	...	...	10·17	...	10·30	67·69	77·86	...
Peak Hill ...	...	...	...	...	...	...	...	...	115·68	2,278·00	969·84	1,085·52	...
East Murchison ...	Lawlers ...	...	...	...	348·87	348·87	...						
Do.	Wiluna ...	...	...	484·00	1,936·15	1,936·15	...	...	10·78	1,572·05	3,755·47	3,766·25	...
Do.	Black Range ...	...	10·78	1,088·05	1,470·45	1,481·23	...						
Murchison ...	Cue	25·88	...	3,042·00	1,705·95	1,731·83	...						
Do.	Meekatharra ...	28·54	57·68	35,386·70	16,870·37	16,956·59	...						
Do.	Day Dawn ...	3·58	51·16	442·60	1,268·51	1,323·25	...	67·11	181·92	45,431·80	23,177·57	23,426·60	...
Do.	Mt. Magnet ...	9·11	73·08	6,560·50	3,332·74	3,414·93	...						
Yalgoo	...	...	...	...	...	...	...	...	2·48	4,280·00	2,609·12	2,611·60	...
Mt. Margaret ...	Mt. Morgans ...	22·17	187·85	444·85	746·07	956·09	...						
Do.	Mt. Malcolm ...	11·81	1·18	106,084·82	31,253·49	31,266·48	2,316·51	50·73	194·13	106,641·67	32,533·95	32,778·81	2,316·51
Do.	Mt. Margaret...	16·75	5·10	112·00	534·39	556·24	...						
North Coolgardie...	Menzies ...	43·19	3·37	1,505·50	2,705·90	2,752·46	...						
Do.	Ularring ...	...	...	637·00	571·37	571·37	...						
Do.	Niagara ...	3·05	...	350·90	272·67	275·72	...	46·24	3·83	2,791·40	3,700·45	3,750·52	...
Do.	Yerilla ...	...	·46	298·00	150·51	150·97	...						
Broad Arrow ...	...	...	...	...	...	...	...	77·20	85·23	15,517·90	8,593·16	8,755·59	...
N.E. Coolgardie ...	Kanowna ...	24·23	86·49	492·10	405·64	516·36	...						
Do.	Kurnalpi ...	46·45	52·35	125·60	93·85	192·65	...	70·68	138·84	617·70	499·49	709·01	...
East Coolgardie ...	East Coolgardie	290·95	265·92	437,268·16	281,829·70	282,386·57	32,534·76	290·95	324·93	437,361·04	281,934·51	282,550·39	32,534·76
Do.	Bulong ...	...	59·01	92·88	104·81	163·82	...						
Coolgardie ...	Coolgardie ...	83·67	37·68	2,324·98	2,422·91	2,544·26	...						
Do.	Kunanalling ...	...	23·75	1,895·50	880·66	904·41	...	83·67	61·43	4,220·48	3,303·57	3,448·67	...
Yilgarn	...	...	...	...	...	...	...	2·79	10·34	2,985·83	4,687·68	4,700·81	...
Dundas	...	...	...	...	...	...	...	2·36	57·95	3,040·00	1,591·05	1,651·36	...
Phillips River ...	...	...	...	...	...	...	...	...	...	249·00	189·72	189·72	...
State generally		...	...	...	...	...	...	...	...	...	...	...	...
Total for 1929 ...		...	...	...	...	...	...	**961·49**	**1,217·48**	**628,400·47**	**369,885·32**	**372,064·29**	**34,891·27**

TABLE III.—*Return showing for the respective Goldfields and Districts, etc.*—continued.

Goldfield.	District.	Total Gold and Silver Yield—Districts.						Total Gold and Silver Yield—Goldfields.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	* Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	* Silver.
		Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley	...	...	...	...	...	...	...	4,503·36	...	17,597·50	14,127·25	18,630·61	...
Pilbara	Marble Bar ...	12,571·18	3,746·92	87,450·53	132,278·15	148,596·25	653·91	19,390·87	4,292·48	129,754·07	206,620·11	230,303·46	682·58
Do.	Nullagine ...	6,819·69	545·56	42,303·54	74,341·96	81,707·21	28·67						
West Pilbara ...	...	...	...	...	...	...	...	5,916·06	275·00	19,322·71	22,117·92	28,308·98	1,331·07
Ashburton	...	...	...	...	...	...	...	8,697·16	315·64	...	...	9,012·80	7,787·69
Gascoyne	...	...	...	...	...	...	...	553·11	34·69	367·00	405·52	993·32	...
Peak Hill	...	...	...	...	...	...	...	2,455·04	4,371·31	531,358·01	263,447·58	270,273·93	2,287·63
East Murchison ...	Lawlers ...	5,614·49	7,597·96	2,040,097·91	914,100·13	927,312·58	25,997·48	7,232·77	24,434·84	3,464,907·10	1,811,395·79	1,843,063·40	42,735·05
Do.	Wiluna ...	102·06	277·46	224,076·00	122,585·06	122,964·58	237·00						
Do.	Black Range ...	1,516·22	16,559·42	1,200,733·19	774,710·60	792,786·24	16,500·57						
Murchison	Cue	1,369·28	5,851·00	497,596·47	400,983·93	408,204·21	513·68	17,646·65	45,507·36	4,721,519·97	3,207,186·63	3,270,340·64	175,927·20
Do.	Meekatharra ...	11,894·76	13,565·14	1,675,822·94	1,086,565·83	1,112,025·73	5,028·90						
Do.	Day Dawn ...	2,476·53	9,956·69	1,976,640·18	1,305,665·72	1,318,098·94	169,210·44						
Do.	Mt. Magnet ...	1,906·08	16,134·53	571,460·38	413,971·15	432,011·76	1,174·18						
Yalgoo	...	...	...	...	...	...	...	1,612·49	1,890·72	251,140·10	176,496·55	179,999·76	1,192·41
Mt. Margaret ...	Mt. Morgans ...	1,868·81	4,107·97	1,033,497·85	552,789·00	558,765·78	5,775·05	8,189·19	19,874·07	6,508,460·73	3,267,279·94	3,295,343·20	160,892·90
Do.	Mt. Malcolm ...	2,843·26	7,651·02	3,843,708·18	1,882,955·84	1,893,450·12	98,269·98						
Do.	Mt. Margaret...	3,477·12	8,115·08	1,631,254·70	831,535·10	843,127·30	56,847·87						
North Coolgardie ...	Menzies ...	1,207·99	4,155·35	1,248,175·68	1,037,744·47	1,043,107·81	19,224·48	4,012·28	14,509·18	2,668,604·24	2,023,740·13	2,042,261·59	30,863·99
Do.	Ularring ...	22·17	1,162·61	300,777·88	292,433·47	293,618·25	5,973·05						
Do.	Niagara ...	1,533·64	1,618·39	899,788·39	500,462·31	503,614·34	5,603·42						
Do.	Yerilla ...	1,248·48	7,572·83	219,862·29	193,099·88	201,921·19	63·04						
Broad Arrow ...	...	...	...	...	...	...	...	19,723·30	16,283·91	896,233·96	496,144·73	532,151·94	2,184·96
N.E. Coolgardie ...	Kanowna ...	104,652·30	11,805·80	972,351·55	606,556·02	723,014·12	2,522·12	116,925·62	18,000·11	979,890·56	620,742·26	755,667·99	2,533·34
Do.	Kurnalpi ...	12,273·32	6,194·31	7,539·01	14,186·24	32,653·87	11·22						
East Coolgardie ...	East Coolgardie	29,105·23	35,287·28	32,821,749·55	20,617,319·66	20,681,712·17	2,211,548·11	55,881·65	50,671·58	32,977,907·71	20,740,299·83	20,846,853·06	2,211,561·03
Do.	Bulong ...	26,776·42	15,384·30	156,158·16	122,980·17	165,140·89	12·92						
Coolgardie	Coolgardie ...	9,805·38	12,282·86	1,594,148·18	1,007,040·89	1,029,129·13	891·44	10,875·53	18,902·69	1,888,413·92	1,238,664·74	1,268,442·96	940·11
Do.	Kunanalling ...	1,070·15	6,619·83	294,265·74	231,623·85	239,313·83	48·67						
Yilgarn	...	...	...	...	...	...	...	102·19	1,556·51	2,367,982·94	1,090,174·76	1,091,833·46	32,288·71
Dundas	...	...	...	...	...	...	...	2,055·75	14,109·96	925,275·86	635,028·92	651,194·63	36,392·90
Phillips River ...	...	...	...	...	...	...	...	483·77	783·42	93,059·20	88,505·62	89,772·81	15,688·17
Donnybrook † ...	...	...	...	...	...	...	...	23·24	...	1,653·30	818·52	841·76	...
State generally	...	...	...	...	...	...	...	154·45	362·00	36·00	7,875·49	8,391·94	30,876·54
Total to 31st December, 1929 ...	...	...	...	...	...	...	...	**286,434·48**	**236,175·47**	**58,443,484·88**	**35,911,072·29**	**36,433,682·24**	**2,756,166·28**

* By-product in the treatment of auriferous ore except Ashburton and State generally. † Abolished 4th March, 1908.

TABLE IV.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT AS REPORTED TO THE MINES DEPARTMENT DURING 1929, AND THE TOTAL PRODUCTION TO DATE.

Kimberley Goldfield.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1929.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Hall's Creek...	...	Voided leases	...	...	...	...	...	...	...	423·00	477·76	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	94·55	62·68	...
Mt. Dockerell	...	Voided leases	...	...	...	...	...	...	...	44·00	435·93	...
Ruby Creek	...	Voided leases	...	...	...	...	...	...	...	12,633·50	9,435·13	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	151·00	127·28	...
The Brockman	...	Voided leases	...	...	...	...	...	...	...	1,352·75	1,404·40	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	2,462·00	1,820·33	...
The Mary ...	...	Voided leases	...	...	...	...	...	...	...	399·00	210·03	...
The Panton	...	Voided leases	...	...	...	...	...	...	...	34·70	138·70	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	3·00	15·01	...
	From Goldfields generally :— Reported by Banks and Gold Dealers		184·27	...	...	...	...	4,503·36	...	...	...	...
		Total	**184·27**	...	...	...	...	**4,503·36**	...	**17,597·50**	**14,127·25**	...

Pilbara Goldfield.

MARBLE BAR DISTRICT.

Bamboo Creek	856	Bulletin	...	...	24·00	5·36	...	...	...	24·00	5·36	...
Do. ...	850	Federation	...	...	15·50	26·85	...	...	...	92·00	409·98	...
Do. ...	819	Forest Abbey	...	18·95	...	...	...	...	18·95	178·00	188·83	...
Do. ...	707	Kitchener	...	...	249·00	571·94	...	...	...	4,731·00	9,349·27	...
Do. ...	740	(Mount Prophecy)	...	...	...	...	...	...	1·11	1,040·50	1,898·07	...
Do. ...	740, 794 ...	Mount Prophecy Leases ...	...	...	194·00	232·34	...	...	...	2,389·00	3,469·83	...
Do. ...	749	(Perseverance)	...	...	...	...	...	...	...	290·50	584·21	...
Do. ...	817	Prince Charlie	...	...	456·00	461·14	...	...	...	937·25	1,888·47	...
Do. ...	857	Princess May	...	...	64·00	10·13	...	...	...	64·00	10·13	...
Do. ...	...	Voided leases	...	...	...	...	...	...	508·66	15,328·60	23,515·49	...
Do. ...	...	Sundry Claims	...	...	45·00	27·62	...	...	307·83	1,306·85	1,570·12	...

Boodalyerrie ...		Voided leases	...	...	...	...	...	...	292·07	120·25	587·86	...
Do. ...		Sundry claims	...	...	...	...	...	...	7·16	...	...	...
Breen's Find...		Voided leases	...	...	...	...	...	...	...	14·00	66·82	...
Elsie ...		Voided leases	...	...	...	...	...	...	...	178·00	352·06	...
Do. ...		Sundry claims	...	...	...	...	...	...	...	10·25	58·01	...
Lalla Rookh...		Voided leases	...	...	...	...	...	...	4·78	3,283·50	4,170·81	574·01
Do. ...		Sundry claims	...	...	...	...	...	...	...	6,992·00	6,892·82	...
Marble Bar ...	844	Anglo French	...	...	91·00	145·82	...	...	...	558·00	852·07	...
Do. ...	854	Coongan Star	...	...	99·00	442·28	...	...	...	179·00	725·79	...
Do. ...	(852)	Great Oversight	...	...	...	...	...	...	...	30·50	61·35	...
Do. ...	845	Outward Bound	...	...	45·00	49·79	...	...	...	992·50	1,227·66	...
Do. ...	851	Viking	...	...	...	...	...	...	...	34·50	45·52	...
Do. ...		Voided leases	...	...	...	...	...	...	181·87	22,362·45	28,352·06	...
Do. ...		Sundry claims...	...	...	73·50	85·68	...	38·68	149·23	5,386·64	6,027·25	...
North Pole ...		Voided leases	...	...	...	...	...	...	...	474·00	340·75	...
Do. ...		Sundry claims	...	...	...	...	...	...	...	50·50	69·56	...
North Shaw...		Voided leases	...	...	...	...	...	7·53	...	762·45	861·28	...
Do. ...		Sundry claims	...	...	...	...	...	...	567·06	...	...	...
Sharks ...		Sundry claims	...	...	...	...	...	145·08	19·37	24·50	93·14	...
Shaw River ...		Voided leases	...	...	...	...	...	...	...	101·00	49·63	...
Talga Talga ...		Voided leases	...	...	...	...	...	...	83·83	574·50	975·98	...
Do. ...		Sundry claims	...	...	...	...	...	50·26	68·99	204·65	520·25	...
Tambourah ...		Voided leases	...	...	...	...	...	...	73·90	1,438·50	1,739·44	...
Do. ...		Sundry claims	...	...	...	...	...	...	171·69	639·25	797·44	...
Warrawoona ...		Voided leases	...	...	...	...	...	...	16·99	10,072·80	18,136·84	...
Do. ...		Sundry claims	...	...	47·00	27·93	...	44·30	403·70	1,174·04	2,191·67	...
Western Shaw ...		Voided leases	...	...	...	...	...	...	...	1,222·50	957·80	...
Do. ...		Sundry claims	...	...	...	...	...	12·52	67·47	...	...	...
Wyman's Well ...		Voided leases	...	...	...	...	...	...	42·86	757·79	1,113·33	...
Do. ...		Sundry claims	...	...	...	...	...	·93	39·41	355·86	592·18	...
Yandicoogina ...		Voided leases	...	...	...	...	...	...	140·76	2,733·20	5,824·23	...
Do. ...		Sundry claims	...	...	...	...	...	...	238·35	103·75	120·34	...
	From District generally :—											
	Sundry Parcels treated at :											
	State Battery, Bamboo Creek		...	...	...	168·00	40·00	...	...	...	3,757·90	79·90
	State Battery, Marble Bar		...	...	...	...	...	...	...	...	621·64	...
	Various Works		...	...	...	...	...	...	...	237·95	1,204·91	...
	Reported by Banks and Gold Dealers		12·67	...	...	...	...	12,271·88	340·88	...	...	...
	Total		**12·67**	**18·95**	**1,403·00**	**2,254·88**	**40·00**	**12,571·18**	**3,746·92**	**87,450·53**	**132,278·15**	**653·91**

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

PILBARA GOLDFIELD—continued.

NULLAGINE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Eastern Creek	219L ...	Shamrock ... [redacted]	...	...	...	...	...	...	...	89·00	109·15	11·77
Do. ...	...	Voided leases	...	...	...	...	...	...	8·19	4,482·00	8,854·88	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	3·77	461·50	751·47	16·90
Elsie ...	...	Voided leases	...	...	...	...	...	...	...	408·25	1,323·85	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	24·00	27·48	...
Jimble Bah ...	...	Voided leases	...	...	...	...	...	...	50·51	2·00	33·01	...
Do. ...	...	Sundry claims	...	10·99	·30	11·61	...	13·79	10·99	·30	11·61	...
McPhee's Creek	...	Voided leases	...	...	...	...	...	...	...	113·00	137·92	...
Middle Creek	...	Voided leases	...	...	...	...	...	...	...	6,848·90	8,603·45	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	286·00	408·82	...
Mosquito Creek	...	Voided leases	...	...	...	...	...	1·07	21·42	7,259·80	12,464·00	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	166·47	2,188·94	3,116·77	...
Nullagine ...	...	Voided leases	...	...	...	...	...	...	13·96	7,453·25	11,335·12	...
Do. ...	...	Sundry claims	...	...	...	...	...	165·69	210·96	3,984·75	9,336·03	...
20-Mile Sandy	...	Voided leases	...	...	...	...	...	...	3·20	5,093·70	7,786·99	...
Do. ...	...	Sundry claims	...	...	...	...	...	33·10	20·55	3,495·65	4,271·29	...
	From District generally :—											
	Sundry Parcels treated at :											
	Doherty's Works	... ...	...	...	...	...	...	...	...	...	1,304·73	...
	State Battery, 20-Mile Sandy ...	... ...	...	...	...	...	...	...	...	62·00	1,815·43	...
	Various Works	... ...	...	...	...	...	...	...	...	50·50	2,649·96	...
	Reported by Banks and Gold Dealers	... ...	...	...	...	...	...	6,606·04	35·54	...	...	...
		Total	**...**	**10·99**	**·30**	**11·61**	**...**	**6,819·69**	**545·56**	**42,303·54**	**74,341·96**	**28·67**

West Pilbara Goldfield.

Croydon ...	...	Voided leases	...	...	...	...	...	...	...	8·00	5·44	...
Hong Kong ...	...	Voided leases	...	...	...	...	...	...	...	331·00	442·45	...
Do. ...	...	Sundry claims	...	...	...	...	...	21·40	·02	9·00	3·15	...

Lower Nicol ...	...	Voided leases	...	...	...	...	...	...	...	1·10	653·20	402·22	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	10·44	2·71	10·00	11·51	...
Mallina ...	...	Voided leases	...	...	...	...	...	...	...	...	141·60	128·44	...
Nicol ...	...	Voided leases	...	...	...	...	...	...	...	...	30·00	11·47	...
Pilbara ...	...	Voided leases	...	...	...	...	...	...	...	48·12	267·00	413·59	...
Do. ...	...	Sundry claims	...	...	...	5·56	...	1·11	86·24	163·00	255·42	...	
Roebourne ...	M.L. 183, M.L. 167	Roebourne Copper Mines, Ltd. ...	...	...	...	...	...	...	...	...	...	21·12	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	...	113·36	577·87	350·74
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	...	108·60	93·85	96·53
Station Peak	...	Voided leases	...	...	...	...	...	177·74	41·37	10,936·00	11,347·42	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	37·50	48·19	...	
Towranna ...	...	Voided leases	...	...	...	...	...	...	2·62	3,965·80	5,187·51	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	22·00	12·35	...	
Upper Nicol ...	...	Sundry claims	...	...	...	...	...	...	...	6·50	2·57	...	
Weerianna ...	(171) ...	Yank Lennan	...	...	...	...	...	...	...	20·00	3·48	...	
Do. ...	...	Voided leases	...	...	...	...	...	...	...	2,436·15	3,079·81	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	64·00	62·90	...	
Whim Creek...	...	Voided leases	...	...	...	...	...	...	...	...	...	883·80	
	From Goldfield generally :— Reported by Banks and Gold Dealers		53·99	...	...	...	...	5,705·37	92·82	...	7·16	...	
	Total		**53·99**	...	...	**5·56**	...	**5,916·06**	**275·00**	**19,822·71**	**22,117·92**	**1,331·07**	

Ashburton Goldfield.

Mt. Mortimer	...	Sundry claims	...	...	...	...	...	364·63	315·64	...	...	74·47	
Uaroo ...	...	Voided leases	...	...	...	...	...	...	...	...	...	7,713·22	
	From Goldfield generally :— Reported by Banks and Gold Dealers		8·66	...	...	...	...	8,332·53	...	...	...	...	
	Total		**8·66**	...	...	...	...	**8,697·16**	**315·64**	...	...	**7,787·69**	

Gascoyne Goldfield.

Bangemall ...	...	Voided leases	...	...	...	...	...	...	6·22	350·70	313·82	...	
Do. ...	...	Sundry claims	...	...	10·30	67·69	...	85·21	28·47	16·30	91·70	...	
	From Goldfields generally :— Reported by Banks and Gold Dealers		10·17	...	...	...	...	467·90	...	...	...	...	
	Total		**10·17**	...	**10·30**	**67·69**	...	**553·11**	**34·69**	**367·00**	**405·52**	...	

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

Peak Hill Goldfield.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Egerton ...	...	Voided leases	...	...	...	...	...	60·86	30·91	4,725·25	2,019·78	...
Do. ...	...	Sundry claims	...	...	...	...	...	235·35	23·51	1,093·75	506·79	...
Horseshoe ...	...	Voided leases	...	...	...	...	...	...	1,962·66	728·38	1,973·46	2·00
Do. ...	...	Sundry claims	...	115·68	...	...	...	15·70	763·80	16·05	45·14	...
Mt. Fraser ...	...	Voided leases	...	...	...	...	...	...	...	389·50	320·96	...
Do. ...	...	Sundry claims	...	...	18·00	22·50	...	88·28	40·61	212·75	212·02	...
Peak Hill ...	448P	Evening Star	...	...	...	...	...	...	17·97	2,748·50	3,986·81	...
Do. ...	491P	Independent	...	...	16·00	22·20	...	...	...	436·00	520·53	...
Do. ...	5P, 306P ...	No. 1 North Leases	...	...	1,762·00	504·65	...	...	61·10	8,242·00	4,752·57	·04
Do. ...	492P	North Star	...	...	69·00	17·55	...	...	10·99	1,032·50	187·60	...
Do. ...	(1P), (2P), (4P), 5P, (6P), (8P), (9P), (13P), (15P), (16P), (26P), (27P), (28P), (29P), (35P), (36P), (43P), (53P), (54P), (63P), (146P), (152P), (190P), (213P), (222P), (239P), (248P), (252P), (262P), (274P), 306P, (313P)	(Peak Hill Goldfields, Ltd.)	...	...	...	...	...	...	191·46	462,057·01	223,273·59	2,285·59
Do. ...	...	Wembley	...	...	149·00	118·16	...	...	...	585·25	326·45	...
Do. ...	...	Voided leases	...	...	...	...	...	...	543·06	23,004·62	8,383·42	...
Do. ...	...	Sundry claims	...	...	264·00	116·87	...	53·11	251·84	21,048·50	6,027·07	...
Ravelstone ...	...	Voided leases	...	...	...	...	...	...	101·64	4,219·85	3,117·68	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	553·60	283·17	...
Wilgeena ...	...	Voided leases	...	...	...	...	...	...	23·54	128·50	146·79	...
Wilthorpe ...	...	Voided leases	...	...	...	...	...	...	...	47·00	20·93	...
Yowereena ...	...	Voided leases	...	...	...	...	...	...	...	19·50	36·46	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	24·50	105·59	...

From Goldfield generally :—														
Sundry Parcels treated at :														
Purcell's Works		...	...	...	...	...	...	...	...	...	3,363·49	...
State Battery, Peak Hill		...	...	...	167·91	...	...	3·05	15·00	3,222·44	...
Various Works		...	...	...	...	...	...	...	30·00	614·84	...
Reported by Banks and Gold Dealers		...	...	...	...	...	2,001·74	345·17	...	...	...
Total		**...**	**115·68**	**2,278·00**	**969·84**	**...**	**2,455·04**	**4,371·31**	**531,358·01**	**263,447·58**	**2,287·59**

East Murchison Goldfield.

LAWLERS DISTRICT.

Bronzewing ...	...	Voided leases	...	...	...	...	...	...	...	468·00	318·03	1·94
Cork Tree ...	...	Voided leases	...	...	...	...	...	...	29·90	3,767·00	3,292·87	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	25·50	13·00	9·32	...
Kathleen Valley	(382)	(Yellow Aster)	...	...	...	...	...	...	...	37,605·00	27,051·42	...
Do. ...	(382)	(Yellow Aster)	...	...	...	...	...	...	...	1,714·00	949·04	...
Do. ...	(382), (1197) ...	Yellow Aster leases	...	...	...	...	...	...	...	3,555·00	2,819·91	...
Do. ...	(382)	(Yellow Aster : Yellow Aster G.M. Co., N.L.)	...	...	...	...	...	...	...	10,359·75	5,425·26	...
Do. ...	...	Voided leases	...	...	...	...	...	...	141·57	23,350·50	11,377·02	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	478·40	1,569·75	913·25	...
Lake Darlot...	...	Voided leases	...	...	...	...	...	...	4,448·42	65,385·30	48,740·44	...
Do. ...	...	Sundry claims	...	...	...	...	...	1·16	474·45	3,972·64	3,387·61	2·60
Lawlers ...	(22), (37), (58), (62), (70), (155), (156), (157), (158), (376), (377), (381), (385), (399), (426), (427), (459), (474), (500), (508), (509), (510), (511), (512), (552), (562), (563), (573), (811), (840)	(East Murchison United, Ltd.) ...	...	...	...	...	...	...	...	291,797·00	155,594·26	900·48
Do. ...	(37), (58), (62), (70), (155), (156), (157), (158), (376), (377), (381), (385), (399), (426), (427), (459), (474), (500), (508), (509), (510), (511), (512), (552), (562), (563), (573), (811), (840)	(London and Western Australian Exploration Co., Ltd.)	...	...	...	...	...	...	...	179,563·00	40,438·14	2,560·31

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST MURCHISON GOLDFIELD—*continued.*

LAWLERS DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine oz.
Lawlers ...	(22), (37), (58), (62), (70), (155), (156), (157), (158), (376), (377), (385), (459), (508), (509), (562), (563), (811), (840), (918), (1053), (1106), (1109), (1110), (1123), (1160)	(Northern Mines, Ltd.)	...	...	...	...	...	...	...	398,856·50	102,005·52	8,356·89
Do. ...	(58), (62), (918), (1178)	Waroonga G.M. Co., Ltd.	...	...	...	...	...	...	3·27	55,416·00	13,455·56	...
Do. ...	1236	Waroonga G.M. Co., Ltd.	...	...	...	348·87	...	...	...	...	544·31	...
Do. ...	(62), (562), (563),	(Waroonga South leases)	...	...	...	...	...	...	...	42,150·00	14,329·48	...
Do. ...	(58)	(Waroonga : London and Western Australian Exploration Co., Ltd.)	...	...	...	...	...	...	...	2,438·50	2,755·45	...
Do. ...	...	Voided leases	...	...	...	...	...	...	687·39	312,396·22	161,912·66	2,533·25
Do. ...	...	Sundry claims	...	...	...	...	...	14·81	261·04	11,551·98	7,115·54	268·34
New England	...	Voided leases	...	...	...	...	...	...	57·54	899·00	720·25	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	4·32	554·50	465·23	...
Sir Samuel ...	(1225)	Combine	...	...	...	...	...	...	...	13·00	7·74	...
Do. ...	(1235)	Dolly Pot	...	...	...	...	...	...	345·54	4·05	67·65	...
Do. ...	...	Voided leases	...	...	...	...	...	...	13·49	266,619·50	139,133·78	10,225·58
Do. ...	...	Sundry claims	...	...	...	...	...	...	22·71	4,350·00	2,995·88	...
Wiluna ...	542, [6J], 548, [7J], (550), [(8J]), (906), ([11J]), (930), ([13J]), (931), ([14J]), (932), ([15J]), (937), ([17J]), (938), ([18J]), (943), ([21J]), (944), ([22J]), (952), ([26J])	(Gwalia Consolidated, Ltd.)	...	...	...	...	...	...	...	210,230·32	74,536·14	69·03
Do. ...	870, [10J] ...	(Moonlight)	...	...	...	...	...	...	...	1,856·00	787·66	...
Do. ...	917, [12J] ...	(Squib)	...	...	...	...	...	...	...	276·50	67·00	...
Do. ...	...	Voided leases	...	...	...	...	...	...	537·27	104,086·75	62,811·02	124·00
Do. ...	...	Sundry claims	...	...	...	...	...	5·30	...	2,841·15	1,516·76	...

From District generally :—													
Sundry Parcels treated at :													
Great Eastern Battery	...	...	...	...	...	...	...	...	...	6,201·33	151·37
Lawlers Public Battery (Retreatment Works) ...	...	...	...	...	...	...	...	...	...	1,439·37	...
Queen Works	...	...	...	...	...	...	...	...	...	1,200·97	39·36
State Battery, Lake Darlot	...	...	...	...	...	...	...	...	315·00	1,097·09	...
State Battery, Sir Samuel	...	...	...	...	...	...	...	...	33·50	1,863·75	...
State Battery, Wiluna	...	...	...	...	...	...	...	...	390·00	2,047·17	20·00
Western Machinery Co., Ltd., Works	...	...	...	...	...	...	...	...	80·00	37·25	...
Various Works	...	...	...	...	...	...	...	...	1,619·50	14,563·26	744·33
Reported by Banks and Gold Dealers	...	...	...	...	...	5,593·22	67·15	...	5·74	...
Total	...	...	...	**348·87**	...	**5,614·49**	**7,597·96**	**2,040,097·91**	**914,100·13**	**25,997·48**

WILUNA DISTRICT.

Collavilla ...	...	Voided leases	...	...	...	...	...	...	...	1,518·00	496·28	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	30·00	21·47	...
Corboy's Find	359J	Corboy's Reward North ...	...	...	...	151·59	...	...	...	1,089·00	803·06	
Do. ...	404J	Tuscana	...	...	...	...	...	...	...	35·00	25·87	...
Do. ...	355J	(Waratah)	...	...	...	...	...	...	...	42·50	31·27	...
Do. ...	355J, 357J ...	Waratah Leases	...	...	...	474·96	...	...	...	234·00	565·98	...
Do. ...	357J	(Waratah South)	...	...	...	...	...	...	...	190·50	126·30	...
Do. ...	...	Voided leases	...	...	...	...	...	...	1·25	1,577·00	1,582·29	5·00
Do. ...	...	Sundry claims	...	...	...	24·84	...	...	...	819·50	394·50	...
Gum Creek ...	...	Voided leases	...	...	...	...	...	...	...	1,334·50	579·16	...
Mt. Keith ...	...	Voided leases	...	...	...	...	...	...	8·29	8,279·50	6,882·05	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	78·26	1,595·25	976·93	...
New England	...	Voided leases	...	...	...	...	...	...	...	952·00	1,309·11	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	137·00	122·49	...
Wiluna ...	91J, [940] ...	(Adelaide)	...	...	...	...	...	...	...	401·00	33·29	...
Do. ...	231J	Brilliant	...	...	...	...	...	...	...	1,326·00	424·03	...
Do. ...	373	Brilliant North	...	...	143·00	157·61	...	...	...	1,043·25	1,673·17	...
Do. ...	6J, [542], 7J, [548], (8J), ([550]), (11J), (13J), (14J), (15J), (17J), (18J), (21J), (22J), (24J), (25J), (26J), (39J), (161J), (163J)	(Gwalia Consolidated, Ltd.)	...	...	...	...	...	...	...	29,774·50	10,780·42	20·29
Do. ...	119J	(Happy Jack)	...	...	...	...	...	...	...	743·00	236·41	...
Do. ...	390J	Lake Violet Deeps	...	...	...	...	...	...	...	11·00	3·79	...
Do. ...	10J [870] ...	(Moonlight)	...	...	...	...	...	...	...	5,181·00	1,078·40	...
Do. ...	10J, [870], 37J, 91J, 109J, (123J)	Moonlight Leases	...	...	...	...	...	...	...	28,767·00	11,991·14	...
Do. ...	377J	Mother of Gwalia	...	...	...	...	...	...	...	15·75	27·10	...
Do. ...	333J	Neb	...	...	...	...	...	...	...	754·75	257·16	...
Do. ...	275J	W.A.	...	...	17·75	5·60	...	...	...	211·25	154·47	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—**continued.**

EAST MURCHISON GOLDFIELD—*continued.*

WILUNA DISTRICT—***continued.***

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Wiluna ...	6J, [542], 7J, [548], (8J), ([550]), (11J), (13J), (14J), (15J), (17J), (21J), (161J), (163J), (193J), 194J, (256J), (257J)	(Western Machinery Co., Ltd.) ...	...	...	...	...	...	...	...	69,555·50	33,178·75	...
Do. ...	12J, [917], (23J), ([946]), (28J), ([954]), (30J), ([959]), (33J), ([967]), (36J), ([975]), (43J), ([1018]), (76J), ([1090]), (113J), 119J, (124J), (137J), ([1002]), 266J	(Wiluna Gold Mines, Ltd.)	...	...	....	...	...	...	...	31,150·75	14,659·20	...
Do. ...	6J, [542], 7J, [548], 12J, [917], 119J, 194J, 262J, 263J, 264J, 266J, 271J, 272J, 276J, 277J, 278J, 280J, 281J, 282J, 283J, 287J, 365J, 366J, 389J, 395J, 397J, 398J, 400J, 402J, 403J, 415J, 416J. 417J, 418J, 419J, 421J	Wiluna Gold Mines, Ltd.	...	...	...	18·74	...	...	...	...	785·47	...
Do. ...	...	Voided leases	...	...	...	...	...	...	27·92	25,451·00	12,203·32	...
Do. ...	...	Sundry claims	...	...	323·25	245·73	...	92·28	158·82	11,654·50	5,990·54	...
	From District generally :—											
	Sundry Parcels treated at :											
	Corboy's Reward North Battery...		...	...	...	...	...	...	...	...	21·88	...
	State Battery, Mt. Keith		...	...	...	...	...	...	...	...	781·64	12·68
	State Battery, Wiluna		...	...	...	838·95	...	...	...	202·00	15,369·99	...
	Tuscana Works		...	...	...	18·13	...	...	...	18·13	...	...
	Reported by Banks and Gold Dealers		...	...	...	...	...	9·78	2·92	...	...	...
	Total		...	...	**484·00**	**1,936·15**	...	**102·06**	**277·46**	**224,076·00**	**122,585·06**	**37·97**

Barrambie ...	...	Voided leases	...	...	...	...	...	...	...	455·50	1,862·24	...
Do. ...	...	Sundry claims	...	...	13·50	16·11	...	3·53	133·52	171·55	510·48	...
Bellchambers	...	Sundry claims	...	...	...	...	...	...	...	159·00	59·81	...
Birrigrin ...	...	Voided leases	...	...	...	...	...	...	820·68	12,018·16	15,040·45	...
Do. ...	...	Sundry claims	...	...	·05	·64	...	...	156·16	752·55	703·96	...
Curran's Find	...	Voided leases	...	...	...	...	...	18·24	222·89	7,038·50	3,001·02	...
Do. ...	...	Sundry claims	...	...	120·00	49·72	...	...	29·38	1,308·50	480·09	...
Erroll's ...	...	Voided leases	...	...	...	...	...	14·17	132·04	72·00	426·68	...
Do. ...	...	Sundry claims	...	...	...	...	...	6·53	399·11	228·00	327·90	...
Hancock's ...	949B	Comedy King	...	...	65·00	70·58	...	...	...	307·75	405·45	...
Do. ...	...	Voided leases	...	...	...	...	...	...	6,523·59	31,359·75	32,496·84	55·72
Do. ...	...	Sundry claims	...	...	37·50	56·09	...	4·21	119·02	2,904·50	1,499·51	...
Maninga Marley	203B, 345B ...	Havilah G.M. Syndicate, Ltd. ...	...	...	58·50	21·42	...	...	...	58·50	21·42	...
Do. ...	203B, 345B ...	(Havilah Leases)	...	...	...	...	...	...	...	1,148·00	1,216·66	...
Do. ...	203B	(Havilah)	...	...	...	...	...	...	...	1,507·50	2,315·74	...
Do. ...	203B	(Havilah)	...	...	...	...	...	...	...	638·00	716·05	...
Do. ...	203B, (243B), (249B), (254B), (287B), (288B), (289B), (305B), (350B), (504B)	(Havilah G.M. Co., N.L.)	...	...	...	...	...	...	...	36,508·00	20,052·80	22·55
Do. ...	203B, (243B), (287B), (289B), (350B)	(Havilah G.M. Co., N.L.)	...	...	...	...	...	...	...	6,026·00	5,029·69	...
Do. ...	203B, (243B), (249B), (254B), (287B), (288B), (289B), (305B)	(Havilah Leases)	...	...	...	...	...	...	...	2,240·00	2,432·48	...
Do. ...	203B, 345B, 203B, 243B, 289B	(Havilah Leases, Tailings Treatment Ltd.)	...	...	...	...	...	...	...	371·00	2,086·50	...
Do. ...	...	Voided leases	...	...	...	...	...	...	195·20	11,977·23	14,442·35	...
Do. ...	...	Sundry claims	...	...	118·50	99·90	...	...	158·16	1,080·00	825·36	...
Montagu ...	...	Voided leases	...	...	...	...	...	...	94·39	9,133·40	7,223·46	...
Do. ...	...	Sundry claims	...	...	304·50	567·50	...	...	45·67	1,376·50	1,391·47	...
Nungarra ...	...	Voided leases	...	...	...	...	...	25·94	952·34	9,000·75	4,813·99	...
Do. ...	...	Sundry claims	...	...	...	...	...	46·67	1,455·98	3,601·90	2,212·33	...
Sandstone ...	...	Voided leases	...	...	...	...	...	4·75	3,611·46	689,348·97	443,108·95	11,754·22
Do. ...	...	Sundry claims	...	3·49	200·00	316·93	...	37·32	1,361·88	5,963·65	3,911·07	...
Youanmi ...	...	Voided leases	...	...	...	...	...	·36	126·92	358,978·78	176,882·54	4,608·55
Do. ...	...	Sundry claims	...	7·29	170·50	77·46	...	1·07	9·60	4,700·25	1,278·41	...
	From District generally :—											
	Sundry Parcels treated at :											
	State Battery, Sandstone		...	...	...	...	...	...	...	222·00	17,491·58	59·53
	State Battery, Youanmi		...	...	...	194·10	...	...	...	40·00	4,778·54	...
	Various Works		...	...	...	...	...	...	...	37·00	5,664·78	...
	Reported by Banks and Gold Dealers		...	...	...	...	...	1,353·43	11·43	...	...	...
	Total		...	**10·78**	**1,088·05**	**1,470·45**	...	**1,516·22**	**16,559·42**	**1,200,733·19**	**774,710·60**	**16,500·57**

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

Murchison Goldfield.

CUE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Barrambie ...	...	Voided leases	...	...	...	...	...	...	22·49	16,903·92	14,338·52	125·60
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	70·50	35·81	...
Cuddingwarra	2050	Little Bell	...	...	...	...	...	...	4·49	579·75	60·95	...
Do. ...	...	Voided leases	...	...	...	...	...	10·59	124·53	100,304·11	54,762·49	100·71
Do. ...	...	Sundry claims	...	...	...	...	...	6·90	91·39	1,092·48	1,438·25	...
Cue ...	...	Voided leases	...	...	...	...	...	41·26	544·21	281,093·62	215,782·63	66·63
Do. ...	...	Sundry claims	...	...	103·50	39·65	...	88·96	624·43	19,415·54	11,647·18	...
Eelya ...	...	Voided leases	...	...	...	...	...	...	8·78	971·00	1,778·94	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	101·86	595·15	630·47	...
Erroll's ...	...	Voided leases	...	...	...	...	...	...	20·25	14,098·50	8,902·24	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	227·00	92·86	...
Mindoolah ...	...	Voided leases	...	...	...	...	...	3·07	...	7,935·50	4,773·33	42·97
Do. ...	...	Sundry claims	...	...	...	...	...	...	9·81	1,017·00	1,130·39	...
Reedy's Find	1977	(Emu)	...	...	...	...	...	...	...	555·50	280·88	...
Do. ...	1981	(Emu North)	...	...	...	...	...	...	...	529·00	282·43	...
Do. ...	1981	Emu North: Mararoa G.M. Co., N.L.	...	...	1,649·00	854·49	...	...	...	13,408·00	6,410·32	5·00
Do. ...	...	Voided leases	...	...	...	...	...	...	214·65	1,346·75	6,107·35	...
Do. ...	...	Sundry claims	...	...	...	...	...	169·59	89·74	505·50	672·27	...
Tuckabianna	2048	Buttercup	...	...	1,105·50	254·33	...	...	...	2,121·50	508·66	...
Do. ...	...	Voided leases	...	...	...	...	...	...	162·70	3,020·00	4,362·51	...
Do. ...	...	Sundry claims	...	...	117·75	37·28	...	24·06	128·00	1,613·00	1,055·94	...
Tuckanarra ...	(2056)	Hermit	...	...	...	...	...	...	10·97	49·00	52·60	...
Do. ...	...	Voided leases	...	...	...	...	...	14·65	3,061·77	18,000·40	20,708·29	172·77
Do. ...	...	Sundry claims	...	...	66·25	29·34	...	99·95	622·49	4,686·98	8,011·66	...
	From District generally:—											
	Sundry Parcels treated at:											
	Cue No. 1 Works		...	...	...	...	...	...	...	1,870·50	6,684·54	...
	State Battery, Cue		...	...	...	413·25	...	...	...	12·75	4,136·40	...
	State Battery, Tuckenarra		...	...	...	77·61	...	...	...	518·50	1,280·77	...
	Various Works		...	...	...	...	...	...	...	5,055·02	22,115·22	...
	Reported by Banks and Gold Dealers		25·88	...	...	...	...	910·25	7·54	...	...	...
	Total		**25·88**	...	**3,072·00**	**1,705·95**	...	**1,369·28**	**5,851·00**	**497,596·47**	**400,983·93**	**513·68**

Abbotts ...	...	Voided leases	...	...	...	...	...	...	26·45	35,210·00	37,124·40	...
Do. ...	...	Sundry claims	...	...	40·25	93·80	...	...	·49	159·10	232·22	...
Belele ...	...	Sundry claims	...	...	...	...	...	...	...	75·50	45·07	...
Burnakura ...	...	Voided leases	...	...	...	...	...	...	3,239·43	38,480·95	30,579·03	26·90
Do. ...	...	Sundry claims	...	...	...	...	...	12·51	81·11	144·50	118·98	...
Chesterfield ...	...	Voided leases	...	...	...	...	...	29·02	409·15	6,756·26	7,445·01	·80
Do. ...	...	Sundry claims	...	...	...	...	...	...	41·63	435·60	487·80	...
Gabinintha ...	...	Voided leases	...	...	...	...	...	...	16·93	21,918·00	13,447·58	815·57
Do. ...	...	Sundry claims	...	49·34	4·50	45·94	...	13·05	123·72	1,085·00	856·66	...
Garden Gully	...	Voided leases	...	...	...	...	...	26·36	74·91	29,854·06	21,435·37	1,102·59
Do. ...	...	Sundry claims	...	...	6·50	6·47	...	...	5·38	494·60	525·79	...
Gum Creek ...	...	Voided leases	...	...	...	...	...	25·27	88·12	3,639·08	3,359·56	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	385·25	306·92	...
Holden's Find	1291N	(Waterloo)	...	...	...	...	...	...	...	14,676·00	5,104·54	...
Do. ...	1291N, 1541N, 1545N, 1546N	Waterloo G.M. Co., N.L.	...	...	110·00	36·20	...	...	...	430·00	142·08	...
Do. ...	...	Voided leases	...	...	...	...	...	...	18·00	1,487·00	1,154·88	...
Do. ...	...	Sundry claims	...	...	38·25	18·00	...	164·95	44·63	268·50	213·97	...
Jillawarra ...	...	Voided leases	...	...	...	...	...	...	1,134·68	1,499·55	2,801·53	...
Do. ...	...	Sundry claims	...	...	...	...	...	169·94	142·95	23·50	53·81	...
Meeka Pools	...	Voided leases	...	...	...	...	...	...	...	111·58	82·27	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	2·84	211·72	184·83	...
Meekatharra...	(1534N)	Empire	...	...	...	5·96	...	...	21·99	76·50	94·47	...
Do. ...	477N	(Fenian)	...	...	...	...	...	...	...	8,831·75	18,289·22	...
Do. ...	477N, 814N ...	Fenian Leases	...	...	...	...	...	...	...	313,485·94	254,989·70	...
Do. ...	1466N	Haveluck	...	...	28·25	59·94	...	...	...	735·25	1,228·39	...
Do. ...	1542N	Ingliston Alberts	...	...	30·25	115·64	...	...	...	46·25	223·14	...
Do. ...	475N	(Ingliston Consols Extended) ...	...	...	...	...	...	...	...	1,536·25	4,248·25	·30
Do. ...	475N, 515N, 729N, 822N	Ingliston Consols Extended Leases	...	...	29,995·00	13,135·43	...	...	...	548,987·22	280,695·34	...
Do. ...	1538N	Ingliston G.M. Co., N.L.	...	...	21·25	41·66	...	...	...	132·75	231·59	...
Do. ...	1539N	Ingliston South	...	...	55·25	185·25	...	...	...	117·50	572·31	...
Do. ...	1547N	Lady Central	...	...	333·20	1,260·16	...	...	...	377·20	1,370·15	...
Do. ...	533N	Marmont	...	...	...	...	...	...	...	55,126·10	39,906·03	...
Do. ...	580N	(Marmont Extended)	...	...	...	...	...	...	...	43·00	38·03	...
Do. ...	580N	Marmont Extended	...	...	19·50	4·45	...	...	...	244·75	226·23	...
Do. ...	580N, (888N) ...	(Marmont Extended Leases) ...	...	...	...	...	...	...	...	152·00	129·61	...
Do. ...	1537N	New Gwalia	...	...	42·50	17·77	...	...	11·44	226·00	226·25	...
Do. ...	1529N, 1540N ...	Prohibition G.M. Co., N.L.	...	...	3,900·00	807·22	...	...	...	10,300·00	1,854·34	...
Do. ...	1530N	United	...	...	...	...	...	...	...	578·50	808·47	...
Do. ...	...	Voided leases	...	...	...	...	...	3·88	638·31	354,221·89	194,582·19	2,454·74
Do. ...	...	Sundry claims	...	8·34	299·00	154·77	...	187·56	226·22	8,820·70	4,509·65	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

MEEKATHARRA DISTRICT—continued.

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1929.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Mistletoe ...	1502N	Munarra	...	...	90·25	201·03	...	...	1,000·24	399·25	469·69	...
Do. ...	...	Voided leases	...	...	...	...	...	4·15	...	...	...	...
Do. ...	...	Sundry claims	...	...	...	...	...	117·97	63·65	...	...	...
Mt. Maitland	...	Sundry claims	...	...	6·00	10·38	...	...	...	47·25	106·63	...
Munara Gully	...	Voided leases	...	...	...	...	...	...	...	13,167·75	6,489·65	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	11·62	90·50	66·31	...
Nannine ...	...	Voided leases	...	...	...	...	...	34·02	599·40	92,013·62	68,207·35	167·45
Do. ...	...	Sundry claims	...	...	59·25	44·55	...	74·53	419·02	2,554·70	2,053·79	...
Quinns ...	...	Voided leases	...	...	...	...	...	7·30	1,186·50	18,931·16	8,886·79	90·70
Do. ...	...	Sundry claims	...	...	...	...	...	15·07	1,172·91	1,671·50	1,458·18	...
Ruby Well ...	...	Voided leases	...	...	...	...	...	...	...	7,443·00	3,988·36	...
Do. ...	...	Sundry claims	...	...	...	...	...	1,015·87	389·32	269·00	345·63	...
Stake Well ...	...	Voided leases	...	...	...	...	...	...	200·12	21,362·00	9,566·18	...
Do. ...	...	Sundry claims	...	...	...	...	...	1·32	31·79	304·50	302·53	...
Star of the East	...	Voided leases	...	...	...	...	...	...	...	27,244·00	20,305·40	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	127·62	94·97	...
Yaloginda ...	1533N	Heroic	...	...	64·25	72·39	...	...	...	214·75	145·80	...
Do. ...	...	Voided leases	...	...	...	...	...	...	1,591·82	25,776·02	13,256·35	8·68
Do. ...	...	Sundry claims	...	...	243·25	31·01	...	13·82	536·58	2,633·67	1,987·32	...
	From District generally :—											
	Sundry Parcels treated at :											
	State Battery, Meekatharra		...	...	...	522·35	...	...	...	14·00	12,909·76	19·00
	Tumbulgum Sand Syndicate Works		...	...	...	...	...	...	...	...	205·95	...
	Various Works		...	...	...	...	...	...	...	172·75	5,793·53	342·17
	Reported by Banks and Gold Dealers		28·54	...	...	...	...	9,978·17	13·79	...	...	...
	Total		**28·54**	**57·68**	**35,386·70**	**16,870·37**	...	**11,894·76**	**13,565·14**	**1,675,822·94**	**1,086,565·83**	**5,028·90**

DAY DAWN DISTRICT.

Day Dawn ...	1D, 170D, 210D ...	Great Fingall Leases	...	...	38·00	16·29	...	...	...	951·25	677·61	...
Do. ...	1D	(Great Fingall No. 1) ...	...	...	...	...	...	...	...	...	5·93	...
Do. ...	1D, (2D), (86D), (87D), (99D), (119D), (129D), (158D), (159D), 170D, (185D), (191D), (209D), 210D, (211D), (212D), (213D), (224D), (225D), (249H), (424D), (453D), (455D), (467D)	Great Fingall Consolidated, Ltd. ...	...	...	...	...	...	...	18·19	1,865,708·45	1,185,412·46	169,210·20
Do. ...	1D	(London, Australian & General Exploration Coy., Ltd.)	...	...	...	...	...	...	...	32·00	10·24	...
Do. ...	573D	Mountain View	...	...	81·75	430·24	...	...	...	81·75	430·24	...
Do. ...	569D	South Fingall	...	...	...	...	...	...	...	2,431·00	1,408·52	...
Do. ...	...	Voided leases	...	...	...	...	...	160·64	545·37	46,027·38	31,319·37	·24
Do. ...	...	Sundry claims	...	51·16	63·75	167·75	...	34·35	357·68	5,218·91	3,195·77	...
Jasper Hill ...	...	Voided leases	...	...	...	...	...	4·90	1,210·23	16,080·75	9,369·47	...
Do. ...	...	Sundry claims	...	...	38·25	3·33	...	...	401·27	533·00	521·10	...
Lake Austin (Island)	536D	Eureka	...	...	...	...	...	...	1,271·01	71·75	933·62	...
Do. ...	...	Voided leases	...	...	...	...	...	601·92	1,591·39	29,954·12	45,477·99	...
Do. ...	...	Sundry claims	...	...	52·25	25·40	...	59·07	567·57	1,005·64	611·43	...
Mainland ...	571D	Mainland Consols	...	...	168·60	625·50	...	...	590·51	207·85	1,293·24	...
Do. ...	...	Voided leases	...	...	...	...	...	·41	2,706·26	7,272·13	23,129·51	...
Do. ...	...	Sundry claims	...	...	...	...	...	3·24	677·12	123·45	170·58	...
	From District generally :—											
	Sundry Parcels treated at :											
	Neptune Works	... ...	...	...	...	...	...	...	...	...	160·57	...
	Various Works	... ...	...	...	...	...	...	...	16·61	940·75	1,537·30	...
	Reported by Banks and Gold Dealers	... ...	3·58	...	...	...	...	1,612·00	3·48	...	·77	...
	Total		**3·58**	**51·16**	442·60	1,268·51	...	2,476·53	9,956·69	1,976,640·18	1,305,665·72	169,210·44

MOUNT MAGNET DISTRICT.

Lennonville ...	964M	(Empress)	...	...	...	...	...	...	...	1,649·00	7,361·81	...
Do. ...	964M	Empress	...	...	...	140·52	...	...	...	80·00	604·61	...
Do. ...	964M, (1078M), (1079M), (1115M), (1116M), (1117M)	Empress Leases	...	...	...	...	...	...	...	4,813·00	3,171·33	...
		Voided leases	...	...	...	...	...	...	3,196·79	134,956 ·23	113,247·68	458·82
		Sundry claims	...	...	232·00	58·33	...	19·14	98·01	3,524·17	2,585·84	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

MOUNT MAGNET DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Mt. Magnet ...	(1228M)	Christmas Gift	...	...	...	...	...	...	...	50·75	352·00	...
Do. ...	1237M	Christmas Gift Extended ...	...	...	84·50	437·75	...	...	...	84·50	437·75	...
Do. ...	1231M	Hill Crest	...	...	3,151·00	621·07	...	...	...	4,241·00	833·23	...
Do. ...	1215M	Hill 60	...	...	2,785·00	1,306·30	...	...	...	11,517·00	5,799·12	...
Do. ...	1201M	Neptune	...	...	...	...	...	...	6·70	466·50	871·20	...
Do. ...	1075M	New Havelock	...	2·16	...	...	...	...	17·93	2,105·00	1,005·29	...
Do. ...	1239M	No Name	...	60·91	...	...	...	...	60·91	...	...	...
Do. ...	1216M	Revenue	...	...	22·75	59·26	...	...	...	67·50	707·09	...
Do. ...	1224M	Saturn	...	...	85·50	77·38	...	...	41·00	534·75	376·25	...
Do. ...	...	Voided leases	...	...	...	...	...	27·83	8,417·96	370,520·61	211,512·03	714·36
Do. ...	...	Sundry claims	...	10·01	199·75	215·13	...	2·81	1,293·63	25,188·50	16,823·31	...
Mt. Magnet, East	...	Voided leases	...	...	...	...	...	63·29	764·53	5,522·28	2,811·75	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	37·22	214·50	144·10	...
Moyagee ...	...	Voided leases	...	...	...	...	...	...	5·08	4,799·35	7,421·83	...
Do. ...	...	Sundry claims	...	...	...	...	...	2·83	111·10	661·73	762·65	...
Paynesville ...	...	Voided leases	...	...	...	...	...	...	1,613·34	97·27	549·10	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	469·98	198·17	894·46	...
Youanmi ...	...	Sundry claims	...	...	...	...	...	...	...	33·00	44·58	...
		From District generally :—										
		Sundry Parcels treated at :										
		Britannia Cyanide Works	...	...	...	...	...	...	...	...	48·56	...
		Long Reef Cyanide Works	...	...	...	...	...	...	...	...	260·76	...
		State Battery, Boogardie	...	...	...	417·00	...	...	...	92·51	18,497·50	...
		Various Works	...	...	...	...	...	...	...	43·06	16,847·32	1·00
		Reported by Banks and Gold Dealers	9·11	...	...	...	...	1,790·18	·35	...	...	...
		Total	**9·11**	**73·08**	**6,560·50**	**3,332·74**	...	**1,906,08**	**16,134·53**	**571,460·38**	**413,971·15**	**1,174·18**

Yalgoo Goldfield.

Adavale ...	...	Sundry claims	...	...	...	...	...	...	...	...	10·00	12·56	...	
Bilberatha ...	...	Voided leases	...	...	...	...	...	...	...	...	554·00	200·07	...	
Do. ...	...	Sundry claims	...	...	84·75	118·74	...	...	2·90		133·75	276·18	...	
Carlaminda ...	...	Voided leases	...	...	...	...	...	....	...		947·32	524·72	3·90	
Do. ...	...	Sundry claims	...	...	6·75	11·65	...	...	...		120·75	83·61	...	
Fields Find ...	907, (909) ...	Brown's Reward Leases ...	...	...	108·00	12·35	...	...	...		4,540·55	3,800·16	...	
Do. ...	902	Field's Find Extended ...	...	...	...	...	...	...	10·38		31·50	31·35	...	
Do. ...	994	Fremantle Gold Mine ...	...	...	378·75	61·44	...	...	...		378·75	61·44	...	
Do. ...	990	Mount William	...	...	21·50	14·71	...	...	...		33·00	17·89	...	
Do. ...	...	Voided leases	...	...	...	...	...	...	209·34		36,558·55	26,968·65	...	
Do. ...	...	Sundry claims	...	2·48	204·00	36·39	...	5·77	166·07		1,614·25	936·51	...	
Goodingnow...	980	Lake View	...	...	683·00	1,166·69	...	...	...		2,081·00	3,211·77	...	
Do. ...	974	Princess Mary	...	...	...	...	...	...	...		38·00	36·01	...	
Do. ...	...	Voided leases	...	...	...	...	...	146·70	272·73		28,696·56	34,125·20	...	
Do. ...	...	Sundry claims	...	...	89·00	46·24	...	148·00	80·76		3,473·50	1,945·98	...	
Gullewa ...	...	Voided leases	...	...	...	...	...	...	·78		23,074·50	15,137·98	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	21·07		711·75	588·21	...	
Kirkalucka ...	...	Sundry claims	...	...	...	...	...	...	...		8·80	4·01	...	
Messenger's Patch	880, 897, 988 ...	Brilliant G.M. Co., N.L. ...	...	...	1,600·00	708·37	58·00	...	...		19,108·00	9,328·11	560·98	
Do. ...	880	(Gnow's Nest)	...	...	...	...	...	...	...		10,938·00	9,827·20	158·06	
Do. ...	880, 897 ...	(Gnow's Nest Gold Mines, Ltd.)	...	...	...	...	...	...	...		6,175·00	6,709·40	363·97	
Do. ...	...	Voided leases	...	...	...	...	...	...	321·80		602·76	389·70	...	
Do. ...	...	Sundry claims	...	...	...	...	...	463·12	333·98		490·55	377·71	...	
Mt. Farmer ...	...	Voided leases	...	...	...	...	...	...	...		64·00	40·19	...	
Do. ...	...	Sundry claims	...	...	23·00	12·80	...	...	...		86·50	44·82	...	
Mt. Gibson ...	...	Voided leases	...	...	...	...	...	...	6·44		434·50	803·57	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	...		76·00	40·84	...	
Ninghan ...	...	Voided leases	...	...	...	...	...	...	...		10·00	1·41	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	...		5·00	17·89	...	
Noongal ...	953	Revival	...	...	21·75	13·76	...	...	...		1,496·75	803·22	...	
Do. ...	...	Voided leases	...	...	...	...	...	...	15·86		3,086·95	1,847·66	...	
Do. ...	...	Sundry claims	...	...	16·00	8·32	...	34·55	64·97		748·75	463·48	...	
Nyounda ...	...	Voided leases	...	...	...	...	...	...	217·63		416·00	183·91	...	
Do. ...	...	Sundry claims	...	..	...	...	...	...	4·28		44·00	33·24	...	
Pinyalling ...	...	Voided leases	...	...	...	...	...	...	1·36		2,281·60	902·03	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	2·59		160·50	132·57	...	
Retaliation ...	993	Hayes Reward	...	...	211·50	93·84	...	...	...		211·50	93·84	...	
Do. ...	...	Sundry claims	...	...	166·00	47·65	...	...	...		166·00	47·65	...	

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

YALGOO GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Rothsay ...	...	Voided leases	...	...	...	...	...	...	...	9,360·25	3,560·38	...
Do. ...	...	Sundry claims	...	...	376·50	167·74	...	...	...	2,457·75	1,125·03	...
Wadgingarra...	...	Voided leases	...	...	...	...	...	...	...	541·61	600·91	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	71·50	38·21	...
Warda Warra	...	Voided leases	...	...	...	...	...	...	...	51·50	24·70	...
Do. ...	...	Sundry claims	...	...	82·00	45·81	...	...	...	468·00	241·59	...
Warriedar ...	...	Voided leases	...	...	...	...	...	...	...	12,122·00	4,313·13	7·30
Do. ...	...	Sundry claims	...	...	207·50	42·62	...	...	2·84	2,249·60	784·51	...
Yalgoo ...	...	Voided leases	...	...	...	...	...	...	3·23	6,314·50	9,965·18	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	19·89	864·00	520·56	...
Yuin ...	...	Voided leases	...	...	...	...	...	...	127·12	66,048·50	27,365·63	130·13
Do. ...	...	Sundry claims	...	...	...	...	...	...	4·70	279·50	59·20	...
	From Goldfield generally :—											
	Sundry Parcels treated at :											
	Brown's Reward Battery		...	...	...	...	...	...	...	...	209·43	...
	State Battery, Goodingnow (Payne's Find) ...		...	...	...	...	...	...	...	38·50	1,957·40	...
	State Battery, Warriedar		...	...	...	...	...	...	...	...	3,884·17	...
	Various Works		...	...	...	...	...	9·42	...	664·00	1,795·78	26·67
	Reported by Banks and Gold Dealers		...	...	...	...	...	804·93	...	...	...	...
	Total		...	2·48	4,280·00	2,609·12	58·00	1,612·49	1,890·72	251,140·10	176,496·55	1,250·41

Mount Margaret Goldfield.

MOUNT MORGANS DISTRICT.

Australia United	...	Voided leases	...	...	...	...	...	...	1,911·63	15,913·69	23,305·76	1·76
Do. ...	...	Sundry claims	...	...	...	...	...	...	580·98	1799·25	2,072·62	...
Eucalyptus ...	...	Sundry claims	...	...	...	...	...	...	...	88·50	107·04	...
Federation Well	...	Voided leases	...	...	...	...	...	...	...	1,248·50	1,782·71	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	108·07	64·68	...
Korong ...	...	Voided leases	...	...	...	...	...	17·95	72·23	2,722·00	3,473·45	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	34·97	279·28	232·89	...

Linden ...	346F, [1024R] ...	Great Carbine	...	...	...	...	...	...	...	...	136·50	41·07	...
Do. ...	(341F), [903R] ...	Torquay	...	...	...	7·93	...	...	...	...	...	7·93	...
Do. ...	(341F), [903R], (343F), [985R]	(Torquay Leases)	...	...	...	...	...	...	...	...	8,245·53	4,964·77	·68
Do. ...	...	Voided leases	...	...	...	...	...	...	...	...	26,124·75	12,939·25	...
Do. ...	...	Sundry claims	...	...	110·00	42·63	...	24·94	6·81		1,406·00	1,052·04	...
Mt. Margaret	...	Voided leases	...	...	...	...	...	·37	...		6,412·89	4,290·53	12·55
Do. ...	...	Sundry claims	...	...	...	...	...	18·38	66·95		366·10	289·21	...
Mt. Morgans	5F, (10F), (19F), (22F), (32F), (73F)	(Westralia Mt. Morgans G.M. Co., Ltd.)	...	...	...	...	...	...	...		575,148·00	294,758·28	5,552·63
Do. ...	7F, (20F), (21F) ...	(Westralia Mt. Morgans G.M. Co., Ltd.)	...	...	...	...	...	...	...		18,261·00	8,127·69	...
Do. ...	5F, (6F), (7F), (10F), (19F), (20F), (22F), (32F), 301F	Westralia Mt. Morgans Mines, N.L. ...	...	...	264·50	522·08	...	...	...		198,368·32	57,008·97	...
Do. ...	...	Voided leases	...	...	...	...	...	...	76·56		38,923·75	22,769·63	77·86
Do. ...	...	Sundry claims	...	187·85	17·00	144·27	...	20·79	314·07		1,415·79	1,867·31	...
Murrin Murrin	...	Voided leases	...	...	...	...	...	10·43	222·93		128,706·22	101,163·09	29·60
Do. ...	...	Sundry claims	...	...	19·00	8·82	...	2·69	245·90		1,634·55	1,695·34	...
Redcastle ...	...	Voided leases	...	...	...	...	...	4·49	436·54		2,509·95	2,169·63	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	103·58		139·00	163·01	...
Yundamindera	...	Voided leases	...	...	...	...	...	...	...		2,553·50	2,093·61	...
Do. ...	...	Sundry claims	...	...	34·35	6·49	...	...	2·35		935·00	606·74	...
	From District generally :—												
	Sundry Parcels treated at :												
	Hainault Sulphide Plant, Kalgoorlie		...	...	...	...	...	...	...		127·21	83·91	...
	State Battery, Linden		...	...	...	13·85	...	...	...		10·00	1,995·19	...
	Westralia Mt. Morgans Works		...	...	...	...	...	...	...		...	153·10	...
	Various Works		...	...	...	...	...	...	...		914·50	3,509·55	99·97
	Reported by Banks and Gold Dealers		22·17	...	...	...	...	1,768·77	32·47		...	...	...
	Total		**22·17**	**187·85**	**444·85**	**746·07**	...	**1,868·81**	**4,107·97**		**1,033,497·85**	**552,789·00**	**5,775·05**

MOUNT MALCOLM DISTRICT.

Cardinia ...	...	Voided leases	...	...	...	...	...	13·87	1,591·66		1,631·74	3,613·33	...
Do. ...	...	Sundry claims	...	...	...	...	...	4·25	24·70		60·00	89·52	...
Diorite King	...	Voided leases	...	...	...	...	...	...	845·23		34,659·03	31,744·34	24·05
Do. ...	...	Sundry claims	...	...	...	...	...	11·21	148·62		2,664·80	3,190·15	...
Dodger's Well	...	Voided leases	...	...	...	...	...	...	57·90		1,299·30	1,927·94	...
Do. ...	...	Sundry claims	...	...	43·00	14·63	...	·95	3·37		849·75	698·56	...
Lake Darlot...	...	Voided leases	...	...	...	...	...	...	...		1,048·11	450·52	...
Do. ...	...	Sundry claims	...	...	...	...	...	64·87	68·99		599·20	146·05	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

MT. MARGARET GOLDFIELD—*continued.*

MOUNT MALCOLM DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Leonora ...	198c	(Eastern)	...	...	...	...	...	...	...	302·00	321·72	...
Do. ...	190c, 198c, 207c, 352c, 353c, 380c, 446c, 447c, (450c), (476c), 489c, 490c, 504c, (523c), 741c, 742c, 807c, 809c, 811, 812c, (813c), (814c), 980c, (981c), 1082c, (1225c), (1226c), (1227c), (1228c), (1229c), (1230c), (1231c), (1232c), 1259c, (1291c), (1292c), 1341c, 1342c, (1343c), (1344c), (1345c), (1346c), (1347c)	Sons of Gwalia, Ltd.	...	...	105,605·00	30,928·69	2,316·51	...	...	3,277,901·67	1,485,845·57	96,545·99
Do. ...	198c, 1082c ...	(Sons of Gwalia South G.M. Co., N.L.)	...	...	...	...	...	...	...	631·00	903·61	...
Do. ...	198c, 1082c ... (1257c), (1258c), 1259c, (1284c), (1285c), (1300c), (1301c)	(Sons of Gwalia South G.M.'s, Ltd.) ...	...	...	...	...	...	...	...	98,239·00	51,593·99	8·66
Do. ...	198c, 1082c, 1259c	(Sons of Gwalia South G.M.'s, Ltd.) ...	...	...	...	...	...	...	...	9,909·00	3,169·89	...
Do. ...	...	Voided leases	...	...	...	...	...	...	1,852·57	162,734·95	87,867·40	10·71
Do. ...	...	Sundry claims	...	...	...	...	...	30·31	330·67	10,766·30	9,505·63	...
Malcolm ...	...	Voided leases	...	...	...	...	...	...	47·07	62,301·78	47,425·54	...
Do. ...	...	Sundry claims	...	...	26·57	22·76	...	5·75	26·50	3,100·22	2,144·49	...
Mertondale ...	...	Voided leases	...	...	...	...	...	...	...	88,663·00	60,840·00	1,497·58
Do. ...	...	Sundry claims	...	...	...	...	...	1·82	63·04	1,092·46	1,538·97	...
Mt. Clifford ...	1329c	Victory No. 1	...	...	130·00	78·34	...	...	249·29	2,645·46	7,940·06	...
Do. ...	...	Voided leases	...	...	...	...	...	...	1,364·45	3,381·50	7,339·23	...
Do. ...	...	Sundry claims	...	1·18	246·25	134·92	...	53·98	278·62	1,341·00	1,824·96	...

Pig Well ...	1547c	Starlight	...	...	...	...	...	...	...	12·00	3·45	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	13,575·32	14,673·13	63·68
Do. ...	...	Sundry claims	...	...	...	...	...	...	34·61	2,738·40	1,160·33	...
Randwick ...	1554c	Coonardoo	...	...	34·00	6·39	...	...	...	34·00	6·39	...
Do. ...	...	Voided leases	...	...	...	...	...	...	239·49	8,065·15	8,671·57	...
Do. ...	...	Sundry claims	...	...	...	...	...	66·57	159·37	1,282·14	944·20	...
Webster's Find	...	Voided leases	...	...	...	...	...	30·30	...	21,760·00	13,970·17	...
Do. ...	...	Sundry claims	...	...	...	...	...	36·84	16·52	1,397·80	939·58	...
Wilson's Creek	...	Voided leases	...	...	...	...	...	...	...	333·40	168·27	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	4·24	5·00	19·04	...
Wilson's Patch	...	Voided leases	...	...	...	...	...	...	99·38	27,595·10	12,638·18	1·05
Do. ...	...	Sundry claims	...	...	...	...	...	4·68	13·73	814·00	1,086·26	...
	From District generally :—											
	Sundry Parcels treated at :											
	State Battery, Leonora		...	...	...	67·76	...	...	...	103·00	11,402·56	98·14
	Various Works		...	...	...	...	...	...	...	371·50	7,151·14	20·12
	Reported by Banks and Gold Dealers		11·81	...	...	...	...	2,517·86	131·00	...	...	...
	Total		**11·81**	**1·18**	**106,084·82**	**31,253·49**	**2,316·51**	**2,843·26**	**7,651·02**	**3,843,708·18**	**1,882,955·84**	**98,269·98**

MOUNT MARGARET DISTRICT.

Burtville ...	2138T	Nil Desperandum	...	...	20·50	61·92	...	...	...	674·87	2,079·65	...
		Voided leases	...	...	...	...	...	2·29	413·80	66,801·18	103,935·19	275·27
Do. ...	...	Sundry claims	5·10	...	...	6·44	...	1·90	138·64	3,261·90	2,949·23	...
Duketon ...	...	Voided leases	...	...	...	...	...	3·54	3,213·21	31,485·42	22,318·21	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	65·43	238·50	370·38	...
Eagle's Nest	...	Voided leases	...	...	...	...	...	...	145·34	331·00	1,215·78	...
Do. ...	...	Sundry claims	...	...	...	...	...	11·45	428·41	147·50	133·96	...
Erlistoun ...	2113T	Baneygo North	...	...	...	...	...	...	29·31	670·00	213·46	...
Do. ...	2141T, 2145T ...	King of Creation Leases ...	...	...	85·00	18·04	...	...	...	1,599·00	657·01	...
Do. ...	...	Voided leases	...	...	...	...	...	...	11·66	27,012·07	18,461·35	...
Do. ...	...	Sundry claims	...	...	...	...	...	1,179·43	116·81	2,197·24	1,976·72	...
Euro ...	...	Voided leases	...	...	...	...	...	...	65·14	91,556·25	37,582·89	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	46·52	259·50	370·57	...
Laverton ...	715T, 806T, (1206T), (1207T), (1483T), (1523T), (1524T), (1525T), (1542T), (1544T), (1548T)	(Kalgoorlie and Boulder Firewood Co., Ltd.)	...	...	...	...	...	...	...	71,802·00	25,003·11	3,364·01
Do. ...	715T, 806T, (1206T), (1207T), (1483T), (1523T), (1524T), (1525T), (1542T), (1544T), (1548T)	(Lancefield G.M. Co., Ltd.)	...	...	...	...	...	...	...	102,179·78	39,402·81	...
Do. ...	715T, 806T, (1206T), (1207T), (1483T), (1523T), (1524)T, (1525T), (1542T), (1544T), (1548T)	(Lancefield G.M. Co., Ltd.)	...	...	...	...	...	...	...	153,829·00	58,842·47	5,824·39

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

MT. MARGARET GOLDFIELD—*continued.*

MOUNT MARGARET DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Do. ...	715T, 806T, (1206T), (1207T), (1483T), (1523T), (1524T), (1525T), (1542T), (1544T), (1548T)	(Lancefield G.M. Co., Ltd.)	...	...	...	...	...	...	...	260,749·00	103,535·54	21,612·29
Do. ...	715T, 806T, (1206T), (1523T), (1524T), (1525T), (1542T), (2050T), (2051T)	Lancefield G.Ms., Ltd.	...	...	...	...	...	...	...	352,730·05	132,745·39	21,081·58
Do. ...	715T, 806T ...	Lancefield Leases	...	...	...	401·82	...	...	...	...	593·12	...
		Voided leases	...	...	...	...	...	20·29	2,024·11	457,506·74	260,928·74	4,674·69
		Sundry claims	...	...	6·50	17·92	...	209·18	1,416·70	5,202·95	5,048·09	...
Mt. Barnicoat	...	Voided leases	...	...	...	...	...	...	...	652·00	359·12	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	23·00	23·37	...
Mt. Shenton...	...	Voided leases	...	...	...	...	...	...	...	15·00	26·65	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	39·25	52·69	...
Quartz Hill ...	...	Voided leases	...	...	...	...	...	...	...	10·00	3·86	...
Red Hill ...	...	Sundry claims	...	...	...	...	...	...	...	27·00	13·76	...
	From District generally :—							...				
	Sundry Parcels treated at :											
	State Battery, Laverton		...	...	...	28·25	...	...	...	97·50	2,893·64	15·64
	Various Works		...	...	...	...	...	...	...	157·00	9,798·34	...
	Reported by Banks and Gold Dealers		16·75	...	...	...	...	2,049·04	...	...	...	...
	Total		**16·75**	**5·10**	**112·00**	**534·39**	...	**3,477·12**	**8,115·08**	**1,631,254·70**	**831,535·10**	**56,847·87**

North Coolgardie Goldfield.

MENZIES DISTRICT.

Comet Vale ...	5217z	(Gladsome)	...	...	...	...	...	...	...	10,879·50	8,678·16	95·29
Do. ...	5217z, (5333z), (5380z), 5476z	(Gladsome Leases)	...	...	...	...	...	...	...	64,875·00	50,329·09	1,410·36
Do. ...	5507z	Lake View	...	...	212·75	43·11	...	...	...	264·25	56·62	...
Do. ...	5217z, 5476z ...	Sand Queen Gladsome Mines, N.L. ...	...	...	170·00	95·94	...	...	...	6,719·00	3,146·91	...
Do. ...	...	Voided leases	...	...	...	...	...	...	419·74	148,246·72	119,318·18	3,839·28
Do. ...	...	Sundry claims	...	...	...	·14	...	...	34·99	947·54	646·27	...

Goongarrie ...	...	Voided leases	...	...	...	...	...	·94	1,027·51	27,198·29	17,428·84	...
Do. ...	...	Sundry claims	...	3·37	19·50	35·30	...	45·52	943·89	1,414·02	1,782·99	...
Menzies ...	5511z	First Hit	...	...	162·50	581·77	...	...	...	162·50	581·77	...
Do. ...	5505z	Golden Age	...	...	320·25	1,017·95	...	...	...	639·00	2,194·22	...
Do. ...	5423z	(Lady Shenton)	...	...	...	...	...	...	...	5,256·58	4,185·99	...
Do. ...	(5423z), 5485z ...	Lady Shenton G.M. Syndicate, Menzies, N.L.	...	...	...	...	...	...	...	73·00	31·50	...
Do. ...	5510z	Macaroni	...	...	107·00	104·83	...	...	...	139·50	114·60	...
Do. ...	5512z	Resurrection	...	...	37·00	29·25	...	...	...	37·00	29·25	...
Do. ...	5484z	Warrior	...	...	102·00	52·60	...	...	...	1,422·00	661·81	...
Do. ...	5508z	Woodroad	...	...	40·00	25·95	...	...	...	40·00	25·95	...
Do. ...	...	Voided leases	...	...	...	...	...	45·42	1,070·55	889,383·47	696,818·53	11,341·73
Do. ...	...	Sundry claims	...	...	294·50	285·29	...	48·75	372·98	21,174·89	16,069·45	776·49
Mt. Ida ...	...	Voided leases	...	...	...	...	...	...	78·26	58,765·37	68,793·24	106·63
Do. ...	...	Sundry claims	...	...	...	2·46	...	43·79	11·95	5,864·00	3,417·66	...
Twin Hills ...	5513z, [805G] ...	Twin Hills Main Reef	...	...	40·00	86·69	...	...	...	40·00	86·69	...
		From District generally :—			...							
		Sundry Parcels treated at :										
		Lady Harriet Battery	...	...	...	344·62	...	...	...	279·50	5,608·80	30·00
		Menzies Mining Exploration Corpn., Ltd., Works	...	...	...	...	...	...	...	639·50	732·04	...
		State Battery, Mt. Ida	...	...	...	...	...	...	...	1,842·25	5,028·57	...
		Various Works	...	...	...	...	...	...	...	1,872·80	31,977·34	1,624·70
		Reported by Banks and Gold Dealers	43·19	...	...	...	...	1,023·57	195·48	...	...	...
		Total	**43·19**	**3·37**	**1,505·50**	**2,705·90**	...	**1,207·99**	**4,155·35**	**1,248,175·68**	**1,037,744·47**	**19,224·48**

ULARRING DISTRICT.

Davyhurst ...	...	Voided leases	...	...	...	...	...	2·93	138·99	155,644·73	123,063·43	5,403·14
Do. ...	...	Sundry claims	...	...	...	...	...	...	30·12	5,999·15	3,219·41	...
Diemel's Find	...	Sundry claims	...	...	...	...	...	...	7·37	102·50	119·13	...
Mulline ...	(998U), (999U) ...	Riverina Proprietary leases ...	...	...	637·00	395·08	...	...	...	2,209·00	1,117·74	...
Do. ...	...	Voided leases	...	...	...	...	...	...	274·09	98,230·72	98,844·73	530·75
Do. ...	...	Sundry claims	...	...	...	...	...	...	53·82	7,122·60	5,061·70	·69
Mulwarrie ...	...	Voided leases	...	...	...	...	...	...	56·84	18,440·68	25,625·54	38·47
Do. ...	...	Sundry claims	...	...	...	...	...	...	21·45	2,099·07	1,888·49	...
Ularring ...	...	Voided leases	...	...	...	...	...	...	563·34	9,429·60	13,647·97	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	143·00	113·15	...
		From District generally :—										
		Sundry Parcels treated at :										
		Hannans Central Battery, Kalgoorlie	...	...	...	...	...	...	...	18·40	4·66	...
		State Battery, Mulline	...	...	...	176·29	...	...	...	538·50	14,251·85	...
		Various Works	...	...	...	...	...	...	15·82	799·93	5,475·67	...
		Reported by Banks and Gold Dealers	...	...	...	...	...	19·24	·77	...	...	...
		Total	...	...	**637·00**	**571·37**	...	**22·17**	**1,162·61**	**300,777·88**	**292,433·47**	**5,973·05**

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

NORTH COOLGARDIE GOLDFIELD—*continued.*

NIAGARA DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Desdemona ...	...	Voided leases	...	...	...	...	...	...	5·73	9,585·25	7,471·39	12·04
Do. ...	...	Sundry claims	...	...	...	...	...	...	8·99	1,331·70	634·19	...
Kookynie ...	...	Voided leases	...	...	...	...	...	...	267·56	735,409·93	389,417·58	5,375·97
Do. ...	...	Sundry claims	...	...	...	5·30	...	39·08	93·85	4,952·35	4,457·72	...
Niagara ...	...	Voided leases	...	...	...	...	...	...	104·54	84,472·50	51,887·97	...
Do. ...	...	Sundry claims	...	...	163·75	86·54	...	28·10	70·23	10,044·16	6,170·89	...
Tampa ...	...	Voided leases	...	...	...	...	...	...	35·94	49,285·87	22,246·08	174·24
Do. ...	...	Sundry claims	...	...	...	38·58	...	28·21	244·17	3,240·68	2,064·61	...
Twin Hills ...	805G, [5513Z] ...	Twin Hills Main Reef	...	...	147·65	101·65	...	...	...	147·65	101·65	...
Do. ...	...	Sundry claims	...	...	39·50	40·60	...	...	...	97·80	86·69	...
		From District generally :—										
		Sundry Parcels treated at :										
		Grafter Battery	...	...	...	...	...	...	...	98·00	448·91	...
		Hainault Sulphide Plant, Kalgoorlie	...	...	...	...	...	...	...	...	9·03	...
		State Battery, Niagara	...	...	...	...	...	...	...	671·50	8,955·70	...
		Various Works	...	...	...	...	...	...	...	451·00	6,509·90	41·17
		Reported by Banks and Gold Dealers	3·05	...	...	...	...	1,438·25	787·38	...	...	...
		Total	**3·05**	**...**	**350·90**	**272·67**	**...**	**1,533·64**	**1,618·39**	**899,788·39**	**500,462·31**	**5,603·42**

YERILLA DISTRICT.

Edjudina ...	1078R	Ace of Hearts	...	...	108·00	67·19	...	...	...	192·00	124·01	...
Do. ...	1011R	Neta	...	...	175·00	77·05	...	...	...	331·75	179·61	...
Do. ...	(1010R), 1011R ...	(Neta leases)	...	...	...	...	...	...	...	407·00	340·01	...
Do. ...	...	Voided leases	...	...	...	...	...	...	18·44	32,387·20	41,851·69	37·79
Do. ...	...	Sundry claims	...	·46	...	...	...	...	21·72	4,055·33	3,305·49	...
Eucalyptus ...	...	Voided leases	...	...	...	...	...	...	2,864·77	1,351·35	3,020·68	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	367·50	362·50	381·82	...
Linden ...	1024R, [346F] ...	Great Carbine	...	...	...	...	...	...	...	67·75	20·30	...
Do. ...	903R, [341F], (985R), ([343F])	Torquay leases	...	...	...	...	...	...	...	325·68	107·45	...

Do. ...	903R, [341F], (904R), (985R), ([343F]), (992R)	(Westralia United Goldfields, Ltd.) ...	...	...	...	...	...	...	...	...	1,995·00	1,452·42	...
Do. ...	...	Voided leases	...	...	...	...	...	7·53	553·16	17,179·60	22,098·74	...	
Do. ...	...	Sundry claims	...	...	...	...	...	77·81	35·11	6,493·25	4,798·42	...	
Mt. Celia ...	...	Voided leases	...	...	...	...	...	...	...	14·00	5·39	...	
Mt. Howe ...	...	Sundry claims	...	...	...	...	...	...	...	5·00	11·13	...	
Mt. Remarkable	...	Voided leases	...	...	...	...	...	...	17·74	528·72	415·09	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	4·00	1·32	...	
Pingin ...	...	Voided leases	...	...	...	...	...	...	46·99	14,637·80	10,306·68	...	
Do. ...	...	Sundry claims	...	...	15·00	6·27	...	...	99·36	3,437·35	2,303·78	...	
Yarri ...	...	Voided leases	...	...	...	...	...	6·30	87·08	37,835·25	19,760·20	2·00	
Do. ...	...	Sundry claims	...	...	...	...	...	·87	5·31	6,571·35	3,321·74	...	
Yerilla ...	...	Voided leases	...	...	...	...	...	...	3,089·51	15,619·21	12,313·06	13·93	
Do. ...	...	Sundry claims	...	...	...	...	...	19·30	15·88	2,401·00	1,338·07	...	
Yilgangie ...	...	Voided leases	...	...	...	...	...	...	...	218·75	295·45	...	
Do. ...	...	Sundry claims	...	...	...	...	...	121·67	29·83	40·50	65·53	...	
Yundamindera	...	Voided leases	...	...	...	...	...	...	80·47	69,067·85	46,004·87	5·82	
Do. ...	...	Sundry claims	...	...	...	...	...	...	85·22	3,151·25	2,740·75	...	
	From District generally :—												
	Sundry Parcels treated at :												
	Neta Battery		...	...	...	...	...	...	...	...	327·37	...	
	State Battery, Linden		...	...	...	...	...	...	...	72·00	4,030·90	...	
	State Battery, Yarri		...	...	...	...	...	...	...	251·50	5,016·74	3·50	
	Various Works		...	...	...	...	...	2·17	...	858·35	7,161·17	...	
	Reported by Banks and Gold Dealers		...	...	...	...	...	1,012·83	154·74	...	...	...	
	Total		...	·46	**298·00**	**150·51**	...	**1,248·48**	**7,572·83**	**219,862·29**	**193,099·88**	**63·04**	

Broad Arrow Goldfield.

Bardoc ...	1833w	Zoroastrian	...	...	...	...	...	...	23·25	22·45	106·77	...
Do. ...	...	Voided leases	...	...	...	...	...	...	1,863·68	73,236·55	51,823·64	203·60
Do. ...	...	Sundry claims	...	...	4·00	16·11	...	53·82	578·02	3,611·11	3,152·38	...
Black Flag ...	...	Voided leases	...	...	...	...	...	27·81	373·99	40,332·13	24,451·48	...
Do. ...	...	Sundry claims	...	...	...	...	...	710·99	182·81	2,181·08	2,087·82	...
Broad Arrow	1771w	North Duke	...	...	29·50	28·56	...	...	1,533·79	182·80	620·92	...
Do. ...	1933w	Oversight Tara United ...	...	65·25	24·50	58·11	...	...	523·24	212·29	506·63	...
Do. ...	...	Voided leases	...	...	...	...	...	54·85	6,915·18	119,584·24	102,266·10	18·85
Do. ...	...	Sundry claims	...	7·31	38·50	12·02	...	987·53	1,347·83	9,468·70	7,110·77	...
Canegrass ...	1942w	Big Four	...	...	73·00	155·60	...	...	...	73·00	155·60	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	89·10	133·13	...
Do. ...	...	Sundry claims	...	8·71	8·00	78·54	...	...	227·55	47·00	346·83	...
Carnage ...	...	Voided leases	...	...	...	...	...	...	...	138·00	251·97	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	90·00	61·22	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

BROAD ARROW GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Paddington ...	...	Voided leases	...	...	...	...	...	5,557·72	257·75	175,109·58	82,198·30	18·96
Do. ...	...	Sundry claims	...	...	...	...	...	1,714·16	20·00	10,544·48	6,725·83	...
Siberia ...	1336w, 1399w ...	Associated Northern Blocks (W.A.), Ltd.	...	...	13,688·00	7,397·23	...	...	...	34,089·61	20,001·59	...
Do. ...	1399w, (1424w), (1429w), (1442w), (1655w) ...	Associated Northern Blocks (W.A.), Ltd.	...	...	...	...	...	...	...	247,585·84	91,053·70	1,664·70
Do. ...	1941w	Bent Tree	...	...	78·75	169·57	...	...	...	100·75	193·42	...
Do. ...	1371w	Gimblet South	...	...	560·50	117·82	...	...	...	73,146·22	12,387·26	...
Do. ...	1399w	(Gimblet South Extended) ...	...	...	...	...	...	...	...	525·00	835·44	...
Do. ...	1399w, (1424w), (1429w), (1442w)	(Gimblet South Extended Leases)	...	...	...	...	...	...	...	215·00	39·98	...
Do. ...	1289w, [716s] ...	Lady Evelyn	...	...	...	...	...	...	2·16	902·00	1,590·04	...
Do. ...	1289w, (1308w) ...	(Lady Evelyn Leases)	...	...	...	...	...	...	25·26	5,376·25	5,267·70	...
Do. ...	1906w	Orinda	...	...	...	8·22	...	...	...	2,456·25	1,859·89	...
Do. ...	1914w	Renown	...	...	58·50	118·82	...	...	595·62	216·50	563·07	...
Do. ...	1375w	(Siberia Consols)	...	...	...	...	...	...	41·58	1,013·50	3,136·03	...
Do. ...	1375w	Siberia Consols	...	...	...	...	...	...	46·30	709·75	1,393·84	...
Do. ...	1375w, (1610w), (1720w)	(Siberia Consols G.M. Co., N.L.) ...	...	...	...	...	...	...	39·23	352·50	598·52	...
Do. ...	1336w	(Slippery Gimblet)	...	...	...	...	...	...	...	26,110·50	8,217·79	...
Do. ...	1336w, (1338w), (1419w)	Slippery Gimblet Leases: Associated Northern Blocks (W.A.), Ltd.	...	...	...	...	...	...	...	6,897·00	2,528·10	...
Do. ...	1936w	Wentworth	...	...	108·00	33·73	...	...	...	2,087·75	867·03	...
Do. ...	...	Voided leases	...	...	...	...	...	...	789·17	25,880·67	14,982·12	...
Do. ...	...	Sundry claims	...	3·96	829·75	359·46	...	253·88	872·47	15,594·54	10,105·08	...
Smithfield ...	...	Voided leases	...	...	...	...	...	...	...	1,027·00	200·90	...
Do. ...	...	Sundry claims	...	...	16·75	2·92	...	...	23·79	98·75	188·16	...
	From Goldfield generally:											
	Sundry Parcels treated at:											
	Hannan's Central Works, Kalgoorlie		...	...	...	...	...	...	...	8·70	15·47	...
	Hainault Sulphide Plant, Kalgoorlie		...	...	...	...	...	4·49	1·24	...	9·57	...
	Pole Works		...	...	·15	23·95	...	...	...	·15	539·69	...
	State Battery, Ora Banda		...	...	...	12·50	...	...	...	72·05	2,928·22	...
	State Battery, Siberia		...	...	...	...	...	...	...	40·00	1,102·96	...
	Zoroastrian Works		...	...	...	...	...	...	...	116·50	1,082·23	...
	Various Works		...	...	...	...	...	2,271·17	...	16,688·67	32,455·14	278·85
	Reported by Banks and Gold Dealers ...		77·20	...	...	...	...	8,086·88	...	...	2·40	...
	Total		77·20	85·23	15,517·90	8,593·16	...	19,723·30	16,283·91	896,233·96	496,144·73	2,184·96

North-East Coolgardie Goldfield.

KANOWNA DISTRICT.

Black Swan ...	...	Voided leases	...	...	...	...	...	...	...	160·00	141·76	...
Gambier ...	...	Voided leases	...	...	...	...	...	...	38·73	12,729·00	6,638·30	·07
Do. ...	...	Sundry claims	...	...	...	...	...	24·70	245·94	858·75	750·42	...
Gindalbie ...	...	Voided leases	...	...	...	...	...	...	19·94	43,613·28	39,438·75	38·31
Do. ...	...	Sundry claims	...	...	...	...	...	...	674·82	1,061·77	1,240·06	...
Gordon ...	(1470x)	Sirdar	...	50·64	76·00	202·51	...	...	50·64	158·00	535·19	...
Do. ...	...	Voided leases	...	...	...	...	...	...	539·24	48,262·78	15,760·43	...
Do. ...	...	Sundry claims	...	...	12·00	6·91	...	...	99·41	678·50	590·85	...
Kanowna ...	(1389x)	Golden Valley	...	...	...	...	...	...	...	6,887·13	5,396·02	...
Do. ...	1464x	Golden Valley West	...	...	350·00	109·20	...	...	...	1,787·00	698·35	...
Do. ...	(1468x)	Kanowna Main Lode	...	1·64	8·00	4·92	...	...	69·64	190·00	119·46	...
Do. ...	...	Voided leases	...	...	...	...	...	14·31	4,436·53	673,113·42	372,848·53	2,482·24
Do. ...	...	Sundry claims	...	5·08	40·35	21·34	...	88·95	1,876·41	15,137·87	8,077·01	1·50
Mulgarrie ...	...	Voided leases	...	...	...	...	...	...	1,216·63	6,902·26	4,197·98	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	13·29	1,187·50	606·16	...
Perkolilli ...	...	Sundry claims	...	29·13	5·75	51·30	...	...	29·13	5·75	51·30	...
Six-Mile ...	...	Voided leases	...	...	...	...	...	...	1,595·63	559·00	767·72	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	31·44	141·50	103·37	...
	From District generally :—											
	Sundry Parcels treated at :											
	Old Cement Works (Martin's Battery) ...		...	...	...	9·46	...	...	...	11,043·78	15,687·73	...
	Various Works		...	...	...	...	...	330·42	867·52	147,874·26	132,820·99	...
	Reported by Banks and Gold Dealers		24·23	...	...	...	...	104,193·92	·86	...	85·64	...
		Total	**24·23**	**86·49**	**492·10**	**405·64**	...	**104,652·30**	**11,805·80**	**972,351·55**	**606,556·02**	**2,522·12**

KURNALPI DISTRICT.

Jubilee ...	...	Voided leases	...	...	...	...	...	...	145·13	1,821·25	1,408·51	...
Do. ...	...	Sundry claims	...	...	30·50	10·96	...	25·57	6·01	131·00	109·58	...
Kurnalpi ...	...	Voided leases	...	...	...	...	...	371·18	3,100·64	2,925·01	2,778·07	6·27
Do. ...	...	Sundry claims	...	52·35	95·10	82·89	...	302·60	256·28	2,336·10	1,123·61	...
Mulgabbie ...	...	Voided leases	...	...	...	...	...	...	1,138·12	84·65	7,429·71	4·95
Do. ...	...	Sundry claims	...	...	...	...	...	6·50	1,528·51	139·50	955·10	...
	From District generally :—											
	Sundry Parcels treated at :											
	Success Battery		...	...	...	...	...	...	...	45·00	188·51	...
	Various Works		...	...	...	...	...	...	...	56·50	193·15	...
	Reported by Banks and Gold Dealers		46·45	...	...	...	...	11,567·47	19·62	...	...	...
		Total	**46·45**	**52·35**	**125·60**	**93·85**	...	**12,273·32**	**6,194·31**	**7,539·01**	**14,186·24**	**11·22**

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD.

EAST COOLGARDIE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Binduli ...	...	Voided leases	...	...	...	...	...	...	...	334·10	224·30	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	566·51	528·43	...
Boorara ...	...	Voided leases	...		...	...	...	...	459·07	306,651·57	171,745·13	408·36
Do. ...	...	Sundry claims	...	...	39·00	63·60	...	·49	53·46	941·07	1,010·80	...
Boulder ...	392E	(Acrobat : Paringa Consolidated Mines, Ltd.)	...	...	...	...	...	...	...	10·25	37·15	...
Do. ...	392E	(Acrobat : Paringa Mines (1909), Ltd.)	...	...	...	...	...	...	...	17,035·57	7,856·69	...
Do. ...	38E, 71E, 72E, (101E)	(Associated Gold Mines of W.A., Ltd.)	...	...	...	...	...	...	8·49	2,204,190·28	1,159,144·86	35,284·05
Do. ...	38E, 71E, 72E ...	Associated Gold Mines of W.A. (New), Ltd.	...	...	51,502·30	24,251·16	722·00	...	...	220,771·66	98,983·65	4,046·52
Do. ...	49E, (4211E) ...	Associated Northern Blocks (W.A.), Ltd.	...	...	161·83	126·52	...	...	538·31	426,723·17	514,095·19	4,844·50
Do. ...	24E	Blue Gap	...	...	58·65	31·87	...	...	...	368·04	197·00	...
Do. ...	(682E), 902E, 923E, 986E, (1064E), 1124E, 1196E, 4075E	(Boulder Deep Levels, Ltd.) ...	...	...	...	...	...	...	...	3,043·00	1,778·10	26·71
Do. ...	902E, 923E, 986E, 1124E, 1196E, 4075E	(Boulder Deep Levels (1907), Ltd. ...	...	...	...	...	...	...	...	787·50	210·30	...
Do. ...	66E	Boulder Perserverance, Ltd.	...	...	64,930·79	35,059·76	8,541·46	...	...	344,211·47	253,791·19	56,398·85
Do. ...	281E	(Brookman Bros. : Boulder G.M. Co., Ltd.)	...	...	...	...	...	...	...	8,655·00	8,417·00	...
Do. ...	5409E	Brownhill	...	...	704·15	1,371·25	...	...	...	1,352·51	2,726·60	...
Do. ...	24E, (888E), (949E)	(Central and West Boulder G.Ms., Ltd.)	...	...	...	...	...	...	...	70,895·31	36,261·65	...
Do. ...	352E	(Chaffers G.M. Co., Ltd.)	...	...	...	...	...	...	...	4,256·00	1,299·03	[illegible]
Do. ...	352E, 873E, 4334E	(Chaffers G.M. Co., Ltd.)	...	...	...	...	...	...	...	111,111·00	44,796·77	[illegible]
Do. ...	352E, 873E, 4334E	(Chaffers Gold Mining Co. (1913), Ltd.)	...	...	...	...	...	...	...	13,350·00	3,334·91	129·57
Do. ...	1621E	(Croesus Proprietary G.M. Co.) ...	...	...	...	...	...	...	...	79·00	45·87	...
Do. ...	5345E	Enterprise	...	...	60·46	20·01	...	...	...	5,235·48	2,920·45	...
Do. ...	351E, 1001E, 1002E, 1085E, 1113E, 1219E, 1326E, 1397E	(Golden Horseshoe Estates Co., Ltd.)	...	...	19·00	142·07	...	...	...	4,812,831·67	2,955,849·33	700,279·22
Do. ...	2325E, 2326E ...	(Golden Link Consolidated G.Ms., Ltd.	...	...	...	...	...	...	...	1,525·00	733·48	...
Do. ...	750E, 1621E ...	(Golden Links, Ltd.)	...	...	...	...	...	...	...	87,115·02	43,504·60	19·06
Do. ...	873E	(Great Boulder Main Reefs, Ltd. ...	...	...	...	...	...	...	...	143,292·39	119,541·14	761·98
Do. ...	66E	(Great Boulder Perseverance G.M., Ltd.)	...	...	...	...	...	...	...	3,306,942·88	1,841,159·00	203,821·43

Do.	...	16E, 51E, 61E, 102E 280E, 1109E, (4361E)	Great Boulder Proprietary G.Ms., Ltd.	...	...	85,293·00	71,410·56	13,480·00	...	...	4,158,218·36	3,513,414·66	415,930·10
Do.	...	902E, 1124E ...	(Great Boulder South G.M. Co., Ltd.)	...	...	...	...	...	...	...	437·00	122·11	...
Do.	...	3643E	(Hainault G.M., Ltd.)	...	...	...	...	...	...	...	517,345·70	184,570·02	113·30
Do.	...	1004E	(Hannans North Croesus G.M. Co., Ltd.)	...	...	...	...	...	...	...	50·00	13·21	...
Do.	...	15E, 60E, 902E, 923E, 986E, 1116E, 1124E, 1196E, 4075E	(Hannan's Star Consolidated, Ltd.)	...	...	...	...	...	...	...	360·00	175·59	...
Do.	...	15E, 16E, 1116E ...	(Hannan's Star G.M. Co., Ltd.) ...	...	...	...	...	...	...	...	85,652·75	40,438·85	2,142·59
Do.	...	15E, 16E, 1116E...	(Hannan's Star, Ltd.)	...	...	...	...	...	...	...	13,470·50	4,716·66	191·22
Do.	...	4317E	Idaho	...	13·16	...	48·14	...	...	1,257·12	387·17	1,147·97	6·20
Do.	...	4317E, (4318E), (4442E)	Idaho Leases	...	...	...	...	...	...	4,847·57	128,727·26	63,546·75	...
Do.	...	31E, 1357E, 1413E, 1507E, 4399E, 4445E, 4476E	(Ivanhoe Gold Corporation, Ltd.) ...	...	...	...	...	...	...	...	4,296,179·00	2,571,681·86	447,123·80
Do.	...	1507E, (2899E), (3712E), (3713E)	(Ivanhoe Junction G.M. Co., N.L.) ...	...	...	...	...	...	...	...	1,764·00	121·43	...
Do.	...	1004E	(Kalgurli Golden Eagle)			...	...	...	...	...	4,891·50	1,289·65	...
Do.	...	1004E	(Kalgurli Golden Eagle: Golden Links, Ltd.)	...	...	...	...	...	...	...	193·00	31·63	...
Do.	...	22E, 34E	(Kalgurli Gold Mines, Ltd.)	...	...	...	...	...	...	...	1,683,548·41	1,072,090·59	188·24
Do.	...	15E, 25E, 31E, 32E, 60E, 352E, 873E, 902E, 923E, 986E, 1116E, 1124E, 1196E, 1357E, 1413E, 1507E, 2325E, 2326E, 4075E, 4334E, 4399E, 4445E, 4476E, 4493E, 4503E, 4508E	Lake View and Star, Ltd.	...	...	138,823·00	95,554·41	9,791·30	...	...	694,751·47	414,823·90	57,875·88
Do.	...	15E, 25E, 32E, 60E, 352E, 873E, 902E, 923E, 986E, 1116E, 1124E, 1196E, 2325E, 2326E, 4075E, 4334E, (4432E), (4433E,) (4434E), 4493E	(Lake View and Star, Ltd.)	...	...	...	...	...	...	...	1,764,864·70	630,551·50	56,537·86
Do.	...	25E, 32E, 2325E, 2326E	(Lake View Consols, Ltd.)	...	...	...	...	...	...	...	1,179,303·55	1,016,875·27	38,491·89
Do.	...	5159E	Lake View South	...	...	187·00	109·89	...	...	...	2,150·36	1,279·99	...
Do.	...	281E, 287E, 444E	(North Kalgurli Co., Ltd.)	...	...	...	...	...	43·99	...	104,116·49	60,229·47	7,202·47
Do.	...	22E, 34E, 281E, 287E, 410E, 444E, 1004E, 1621E, 5405E, 5407E, 5413E	North Kalgurli (1912), Ltd.	...	...	18,822·41	9,746·55	...	...	...	20,259·45	10,687·02	...
Do.	...	287E, 444E ...	(North Kalgoorlie (1912), Ltd.) ...	...	...	...	...	...	...	...	36,420·37	19,377·61	...
Do.	...	5232E	(Old Bank of England)	...	...	...	...	...	...	...	1,082·68	972·85	...
Do.	...	5232E	Old Bank of England–Boulder Perseverance, Ltd.	...	...	45·16	17·09	...	...	...	84·47	28·15	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD—*continued.*

EAST COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Boulder ...	(73E), 410E, (448E), (532E), (578E), (698E), 944F, (1395E), (3301E), (4180E)	(Oroya Brownhill Co., Ltd.)	...	...	...	...	...	...	...	1,075,862·55	1,163,881·77	61,682·30
Do. ...	(6E), 22E, 34F, (73E), (131E), (245E), (269E), (301E), 410E, (448E), (532E), (578E), (698E), (739E), (743E), (750E), (794E), 944E, (969E), 1004E, (1395E), 1621E, (3031E), (4180E), 5405E, (5406E), 5407E, 5408E, 5409E, (5410E), 5413E	(Oroya Links, Ltd.)	...	...	...	...	...	...	...	1,017,456·92	447,023·92	28,532·96
Do. ...	5428E	Oroya South Block	...	2·10	47·83	61·61	...	...	2·10	47·83	61·61	...
Do. ...	392E	Paringa Mining & Exploration Co., Ltd.	...	...	...	...	...	...	...	193·31	64·50	...
Do. ...	(4E), 392E ...	Paringa Mines (1909), Ltd.	...	...	...	...	...	...	...	26,890·74	12,599·54	...
Do. ...	1208E, 3612E, 3643E	South Kalgurli Consolidated, Ltd. ...	...	...	72,203·00	40,135·33	...	...	...	1,377,035·53	593,457·67	15,071·52
Do. ...	1208E, 3612E ...	(South Kalgurli G.M's., Ltd.) ...	...	...	...	...	...	...	...	826,909·00	347,222·75	17,609·67
Do. ...	...	Voided leases	...	...	...	...	...	109·90	5,888·84	488,403·52	406,545·87	·63
Do. ...	...	Sundry claims	...	36·56	417·22	284·49	...	24·58	42·36	3,910·70	2,256·68	...
Feysville ...	Block 48 ...	Hampton Gold Mining Areas, Ltd.—	...	...	...	...	...	...	15·36	278·73	443·28	...
		P.P.L. 40—Learhinan, D. ...	...	...	...	...	...	...	...	8·00	9·68	...
		P.P.L. 306—Excelsior	...	...	...	...	...	...	...	17·00	2·79	...
		P.P.L. 63, 84, 86—Golden Hope G.M's., N.L.	...	...	...	...	...	...	...	16,588·84	8,505·97	69·60
		P.P.L. 98—Mabie, C. C.	...	...	...	...	...	...	...	...	2·62	...
		P.P.L. 1—White Hope: Hopeful Syndicate, Ltd.	...	...	...	...	...	...	...	29,850·03	11,729·78	...
		Sundry claims	...	...	...	...	...	...	...	20·53	22·06	...
Do. ...	Block 48 ...	(Hampton Plains Estate, Ltd.) ...	...	...	...	...	...	4,565·62	21·59	20,615·28	2,502·56	...
Do. ...	Block 50 ...	(Hampton Plains Estate (1906), Ltd.	...	...	...	...	...	...	...	85·00	108·82	...
Do. ...	Block 50 ...	(Hampton Properties, Ltd.)	...	...	...	...	...	...	7·26	6,348·00	3,956·22	...
Do. ...	Block 45 ...	Hampton Properties, Ltd.—										
		P.P.L. 252—Mount Martin ...	...	...	...	...	...	...	...	9,563·00	4,675·67	...
		Cancelled leases	...	...	...	...	...	...	52·75	69·75	80·52	...

Do. ...	Block 50 ...	Hampton Properties, Ltd.—												
		P.P.L. 12—Celebration Junction ...	...	...	...	...	...	...	...	718·57	772·06	...		
		P.P.L. 9, 274—Hampton Celebration (W.A.), Ltd.	...	...	...	...	...	...	...	22,117·75	9,461·47	...		
		P.P.L. 222—Hampton Jubilee ...	...	...	...	...	...	...	...	382·06	278·75	...		
		P.P.L. 177—Hansen, A. L. ...	...	...	194·50	84·35	...	...	...	194·50	84·35	...		
		P.P.L. 74—Lavis, H.	...	...	...	...	...	...	...	7·00	1·68	...		
		P.P.L. 117—Mason and party ...	...	...	91·50	62·33	...	...	...	91·50	62·33	...		
		P.P.L. 17—McFarlane	...	...	...	...	...	...	...	67·40	33·40	...		
		P.P.L. 23—Mutooroo Copper Corporation, N.L.	...	...	...	...	...	...	...	1,436·88	2,256·19	...		
		P.P.L. 10—Pernatty Central Copper Mg. Co., N.L.	...	...	182·04	155·76	...	...	·75	1,229·64	1,067·12	...		
		P.P.L. 29—Pernatty East ...	...	...	...	...	...	...	...	11·27	3·43	...		
		Cancelled leases	...	...	...	...	...	...	106·23	943·27	699·50	...		
Do. ...	...	Voided leases	...	...	...	...	...	...	110·74	561·30	394·24	...		
Do. ...	...	Sundry claims	...	...	26·43	27·22	...	...	92·23	475·83	428·49	...		
Kalgoorlie ...	5432E	Cassidy's Hill	...	...	7·00	7·59	...	...	...	7·00	7·59	...		
Do. ...	(5418E)	Charles	...	...	...	...	...	...	...	22·00	25·85	...		
Do. ...	(5421E)	Close's Find	...	...	...	...	...	...	...	6·00	3·93	...		
Do. ...	(5430E)	Early Bird	...	...	19·00	3·24	...	...	...	19·00	3·24	...		
Do. ...	(5350E), (5351E)	Great Boulder Proprietary G.Ms., Ltd.	...	...	...	...	...	...	...	8,980·56	6,365·89	...		
Do. ...	(4546E), 4547E, 4548E	Hannan's Hill Leases	...	...	2,615·50	692·22	...	...	...	6,660·50	2,801·79	...		
Do. ...	(4546E), 4547E, 4548E, (4551E)	(Hannan's Reward, Ltd.) ...	...	...	...	...	...	...	5·72	33,378·00	9,005·69	...		
Do. ...	(5416E)	Miss Australia	...	...	42·00	45·08	...	...	...	871·00	593·00	...		
Do. ...	4632E	North End	...	...	...	...	...	...	...	388·68	89·36	...		
Do. ...	5415E	Return	...	...	...	...	...	...	...	43·00	21·04	...		
Do. ...	(5368E)	Rose of Diorite	...	...	...	...	...	...	1·73	4,204·50	3,950·59	...		
Do. ...	...	Voided leases	...	...	...	...	...	242·48	9,485·70	943,220·65	384,757·19	44,017·12		
Do. ...	...	Sundry claims	...	2·19	116·78	106·39	...	209·38	509·61	46,665·35	19,748·20	...		
Wombola ...	5424E	Cairngorm	...	...	22·00	14·41	...	...	...	22·00	14·41	...		
Do. ...	5420E	Eclipsall	...	...	77·00	66·17	...	...	...	175·00	248·24	...		
Do. ...	4766E	Great Hope	...	211·50	380·00	1,708·00	...	...	358·11	4,181·53	19,026·30	...		
Do. ...	...	Voided leases	...	...	...	...	...	...	1,872·31	9,918·25	13,547·12	...		
Do. ...	...	Sundry claims	...	·41	179·61	242·77	...	...	4·56	2,074·17	2 894·25	...		
	From District generally :—													
	Sundry claims		...	...	....	105·74	...	11,014·57	464·94	5,440·46	2,511·13	...		
	Sundry Parcels treated at :													
	Fraser's Works		...	...	...	14·08	...	...	...	...	115·27	...		
	Great Boulder Perseverance Battery		...	...	...	...	...	...	...	...	7·18	...		
	Hainault Sulphide Plant		...	...	...	...	...	...	...	35·66	5,658·62	870·95		
	Hannan's Central Battery		...	...	...	18·98	...	...	...	193·80	65,703·23	67·17		
	Hannan's Reward Battery		...	...	...	41·06	...	...	...	...	2,456·33	...		
	Kalgurli G.M. Ltd. Works		...	...	...	...	...	...	...	7·44	658·04	...		
	Lone Hand Works		...	...	...	...	...	...	14·43	507·00	6,189·24	...		
	North Kalgurli Battery		...	...	...	...	...	...	...	...	810·22	...		
	Oroya Links Battery		...	...	...	...	...	...	...	32·34	453·58	...		
	Various Works		...	...	...	...	...	384·36	50·27	39,778·06	170,524·43	11,640·89		
	Reported by Banks and Gold Dealers		290·95	...	...	...	...	12,509·86	9,015·67	2·39	52·06	...		
	Total		**290·95**	**265·92**	**437,268·16**	**281,829·70**	**32,534·76**	**29,105·23**	**35,287·28**	**32,821,749·55**	**20,617,319·66**	**2,211,548·11**		

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD—*continued.*

BULONG DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Balagundi ...	...	Voided leases	...	...	...	...	...	...	2,408·98	1,110·68	1,473·73	12·92
Do. ...	...	Sundry claims	...	...	13·53	23·71	...	...	242·32	314·79	281·25	...
Bulong ...	1266Y	Peacehaven	...	...	...	...	...	...	...	22·10	128·76	...
Do. ...	(1191Y)	Sweet Nell	...	...	...	...	...	...	...	400·84	980·20	...
Do. ...	...	Voided leases	...	...	...	...	...	107·54	8,433·70	99,635·96	82,526·49	...
Do. ...	...	Sundry claims	...	59·01	79·35	81·10	...	1,648·60	1,215·26	7,102·41	15,154·27	...
Hogan's Find	...	Voided leases	...	...	...	...	...	...	908·82	309·50	276·51	...
Majestic ...	Block 41 ...	Hampton Gold Mining Areas, Ltd. :— P.P.L. 275—Long Looked For ...	...	...	...	...	...	19·45	...	235·34	218·57	...
Do. ...	Block 41 ...	(Hampton Properties, Ltd.)	...	...	...	...	...	...	...	41·00	22·66	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	1,007·70	333·30	...
Do. ...	...	Sundry claims	...	...	...	...	...	42·88	43·20	101·90	46·25	...
Mt. Monger ...	...	Voided leases	...	...	...	...	...	...	1,862·57	1,128·35	979·59	...
Do. ...	...	Sundry claims	...	...	...	...	...	215·60	...	369·80	302·47	...
Do. ...	...	Voided leases	...	...	...	...	...	...	60·04	31,820·04	10,645·98	...
Do. ...	...	Sundry claims	...	...	...	...	...	20·45	...	1,893·55	486·04	...
Sudden Jerk...	...	Voided leases	...	...	...	...	...	...	63·91	14·25	53·67	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	·15	10·23	...
Taurus ...	...	Voided leases	...	...	...	...	...	2·06	3·70	1,697·60	891·34	...
Do. ...	...	Sundry claims	...	...	...	...	...	112·69	47·56	311·50	530·82	...
Trans Find ...	(11 8Y)	Transville	...	...	...	...	...	...	...	957·42	831·03	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	4·50	31·63	...
Woodline ...	...	Voided leases	...	...	...	...	...	...	...	792·75	610·57	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	39·33	61·57	...

From District generally :—													
Sundry claims	...	...	...	...	...	...	...	5·64	41·85	744·55	254·99	...	
Sundry Parcels treated at :													
Various Works	...	...	...	...	...	...	...	...	...	6,102·15	5,848·25	...	
Reported by Banks and Gold Dealers	...	...	...	...	...	...	...	24,601·51	52·39	...	...	...	
Total	...	**59·01**	**92·88**	**104·81**	...	**26,776·42**	**15,384·30**	**156,158·16**	**122,980·17**	**12·92**			

Coolgardie Goldfield.

COOLGARDIE DISTRICT.

Bonnievale ...	4600	Melva Maie	...	...	...	...	...	...	...	...	580·00	1,522·44	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	25·00	350,852·84	188,088·12	...
Do. ...	...	Sundry claims	...	...	128·00	54·86	...	...	...	122·62	2,471·33	2,941·20	...
Bulla Bulling	...	Voided leases	...	...	...	...	...	...	...	...	776·81	668·19	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	12·82	375·56	263·64	...
Burbanks ...	...	Voided leases	...	...	...	...	...	13·36	342·96	408,391·36	301,719·13	521·06	
Do. ...	...	Sundry claims	...	...	373·50	185·51	...	43·37	158·43	5,983·65	4,874·12	...	
Cave Rocks ...	...	Voided leases	...	...	...	...	...	...	...	132·00	28·04	...	
Coolgardie ...	5218	Great Western	...	...	67·30	124·92	...	...	...	88·30	595·21	...	
Do. ...	4567	Griffiths' Gold Mine	...	...	...	...	...	...	4·16	17,782·50	2,043·31	...	
Do. ...	Block 59 ...	Hampton Gold Mining Areas, Ltd....	...		...	...	...	...	...	9·00	1·57	...	
		P.P.L. 308—Golden Bell ...	...	...	44·50	54·15	...	...	29·57	149·25	274·30	...	
		P.P.L. 119—Golden Eagle ...	...	...	...	6·87	...	...	...	529·09	1,048·99	...	
Do. ...	Block 49 ...	Hampton Plains Estates, Ltd. ...	...		...	...	...	...	10·94	150·00	157·31	...	
		P.P.L. 384—A. W. Paul ...	...	...	...	...	...	...	...	39·25	20·95	...	
		P.P.L. 395—A. W. Paul ...	...	...	...	...	...	...	...	18·00	21·54	...	
Do. ...	Block 53 ...	(Hampton Plains Estate, Ltd.) ...	...	...	...	...	...	...	358·42	67·00	112·49	...	
Do. ...	Block 59 ...	(Hampton Plains Estate, Ltd.) ...	...	...	...	...	...	...	4·12	8,008·25	7,194·52	...	
Do. ...	5225	Queen Extended	...	...	11·50	35·88	...	...	...	11·50	35·88	...	
Do. ...	...	Voided leases	...	...	...	...	...	1,299·02	4,494·64	543,683·98	320,522·17	·96	
Do. ...	...	Sundry claims	...	4·67	844·30	461·32	...	138·37	2,105·80	40,551·91	17,197·28	...	
Eundynie ...	...	Voided leases	...	...	...	...	...	...	...	29,812·50	14,966·76	1·75	
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	117·00	31·11	...	
Gibraltar ...	4586	Carlton	...	...	19·00	11·98	...	...	15·28	1,546·00	1,238·92	...	
Do. ...	5217	Lloyd George	...	...	451·13	714·34	...	...	...	653·13	928·29	...	
Do. ...	5200	Perseverance	...	...	20·00	4·18	...	...	...	324·62	298·45	...	
Do. ...	... ...	Voided leases	...	...	...	...	...	...	...	29,343·25	14,916·26	...	
Do. ...	... ...	Sundry claims	...	...	89·00	55·62	...	...	48·55	982·95	727·80	...	
Gnarlbine ...	...	Voided leases	...	...	...	...	...	...	10·94	1,899·75	1,049·90	...	
Do. ...	...	Sundry claims	...	...	61·50	29·62	...	...	1·31	289·60	200·23	...	

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued

COOLGARDIE GOLDFIELD—*continued.*

COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Higginsville ...	...	Voided leases	...	...	...	...	...	...	287·26	32,578·00	14,938·44	134·79
Do. ...	...	Sundry claims	...	...	...	...	...	...	17·03	772·90	516·90	...
Londonderry...	...	Voided leases	...	...	...	...	...	...	46·25	27,102·85	18,537·59	...
Do. ...	...	Sundry claims	...	...	145·00	54·61	...	...	6·00	2,009·67	1,688·90	...
Mungari ...	...	Voided leases	...	...	...	...	...	...	17·71	735·00	331·78	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	107·82	346·51	204·90	...
Paris	...	Voided leases	...	...	...	...	...	...	4·30	...	...	...
Red Hill ...	...	Voided leases	...	...	...	...	...	...	1,541·48	40,797·40	31,070·65	...
Do. ...	...	Sundry claims	...	13·02	...	...	...	...	47·64	160·42	287·90	...
Ryan's Find ...	...	Voided leases	...	...	...	...	...	...	...	54·16	151·69	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	·44	87·69	226·64	...
St. Ives ...	5195	Clifton	...	...	...	...	...	...	...	1,319·65	574·37	...
Do. ...	5220	Double Yolk	...	4·95	25·25	58·90	...	...	4·95	25·25	58·90	...
Do. ...	4732	Ives Lake View Reward Junction	...	...	...	6·03	...	...	...	4,091·75	2,488·78	...
Do. ...	4720, 4721, 4722	Ive's Reward Gold Mines, N.L. ...	...	...	...	109·79	...	...	...	12,879·41	3,988·10	...
Do. ...	4720, 4721, 4722	(Lake View Reward Leases)	...	...	...	...	...	...	...	883·25	544·64	...
Do. ...	...	Voided leases	...	...	...	...	...	54·63	40·78	3,992·00	3,306·71	...
Do. ...	...	Sundry claims	...	15·04	...	61·25	...	207·36	881·83	994·56	512·93	...
Widgiemooltha	5207	Elgin	...	...	30·00	42·07	...	...	...	335·50	453·28	...
Do. ...	...	Voided leases	...	...	...	...	...	9·42	867·11	9,960·35	7,413·68	·17
Do. ...	...	Sundry claims	...	...	15·00	19·48	...	33·84	123·66	4,812·86	2,812·37	...
	From District generally :—											
	Sundry Parcels treated at :											
	Highgate Battery		...	...	...	...	...	...	...	100·00	336·90	...
	Imperial Battery		...	...	...	20·39	...	...	...	26·00	161·57	...
	State Battery, Coolgardie		...	...	...	311·14	...	...	...	691·01	14,514·55	9·65
	State Battery, St. Ives		...	...	...	...	...	...	...	60·50	982·52	...
	Various Works		...	...	...	...	...	7·75	...	3,711·11	17,248·08	223·06
	Reported by Banks and Gold Dealers		83·67	...	...	...	...	7,998·26	543·04	...	...	...
	Total		**83·67**	**37·68**	**2,324·98**	**2,422·91**	...	**9,805·38**	**12,282·86**	**1,594,148·18**	**1,007,040·89**	**891·44**

Balgarrie ...	...	Voided leases	...	...	...	...	...	...	10·94	75·48	5,142·25	4,825·96	1·38
Do. ...	...	Sundry claims	...	...	116·50	17·15	...	...	...	18·57	1,266·25	441·89	...
Carbine ...	33s	(Carbine)	...	...	...	...	...	...	...	10·85	2,401·00	1,164·53	...
Do. ...	33s	Carbine	...	...	1,540·00	635·04	...	...	...	...	4,040·00	2,260·06	...
Do. ...	33s, (710s), (711s), (807s), (863s), (890s)	(Carbine Leases)	...	...	...	...	...	...	...	677·13	49,590·86	38,697·72	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	...	3,347·00	3,233·60	...
Do. ...	...	Sundry claims	...	...	25·00	7·47	...	...	123·94	...	118·00	182·76	...
Carnage ...	...	Voided leases	...	...	...	...	...	176·04	659·31	2,402·00	2,170·67	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	61·00	27·50	...	
Cashman's (Siberia)	716s, [1289w] ...	Lady Evelyn	...	...	...	...	...	...	...	241·75	479·81	...	
Do. ...	...	Voided leases	...	...	...	...	...	67·51	793·44	7,187·90	6,395·33	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	6·16	116·00	67·61	...	
Chadwin ...	...	Voided leases	...	...	...	...	...	...	...	1,111·75	2,062·12	...	
Do. ...	...	Sundry claims	...	...	...	...	...	...	8·87	560·00	482·49	...	
Dunnsville ...	...	Voided leases	...	...	...	...	...	...	181·12	17,407·10	7,982·23	...	
Do. ...	...	Sundry claims	...	...	26·00	45·01	...	·43	169·82	385·19	539·36	...	
Jourdie Hills	...	Voided leases	...	...	...	...	...	...	18·00	28,009·74	19,401·09	28·45	
Do. ...	...	Sundry claims	...	9·67	...	...	...	1·86	37·52	771·50	441·24	...	
Kandana ...	...	Voided leases	...	...	...	...	...	...	...	465·00	68·12	...	
Kintore ...	...	Voided leases	...	...	...	...	...	6·66	143·66	44,174·14	31,882·70	...	
Do. ...	...	Sundry claims	...	...	...	...	...	100·30	20·63	1,259·20	1,199·39	...	
Siberia ...	...	Voided leases	...	...	...	...	...	1·07	1,557·81	8,216·85	10,530·14	...	
Do. ...	...	Sundry claims	...	...	...	...	...	30·91	...	223·00	349·86	...	
25-Mile ...	(900s)	Shamrock	...	...	48·00	71·58	...	...	...	48·00	71·58	...	
Do. ...	645s	Star of Fremantle	...	...	66·00	57·75	...	32·67	...	5,597·50	4,166·89	...	
Do. ...	...	Voided leases	...	...	...	...	...	...	1,712·20	99,648·97	81,058·81	18·84	
Kunanalling	...	Sundry claims	...	14·08	54·00	27·24	...	206·01	528·16	8,702·53	6,474·26	...	
From District generally :—													
Sundry Parcels treated at :													
Blue Bell Battery			...	...	20·00	19·42	...	18·15	...	92·00	2,575·18	...	
Various Works			...	...	...	...	...	24·08	...	1,679·26	2,390·95	...	
Reported by Banks and Gold Dealers			...	...	...	...	...	269·58	1·10	...	...	...	
Total			**...**	**23·75**	**1,895·50**	**880·66**	**...**	**1,070·15**	**6,619·83**	**294,265·74**	**231,623·85**	**48·67**	

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued

Yilgarn Goldfield.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Blackbourne...	...	Voided leases	...	...	...	...	...	...	...	1,282·50	341·37	...
Bullfinch ...	3345	Copperhead	...	...	310·75	47·14	...	...	...	390·75	68·97	...
Do. ...	3337	Easter Gift	...	...	83·75	19·50	...	...	46·62	596·75	259·71	...
Do. ...	3350	Rising Sun	...	...	44·00	8·05	...	...	...	153·75	121·24	...
Do. ...	3363	White Hope	...	...	51·50	29·04	...	...	...	80·50	42·53	...
		Voided leases	...	...	...	...	...	...	3·57	480,825·76	178,879·50	27,833·41
		Sundry claims	...	...	30·50	48·82	...	3·71	...	1,320·30	965·74	...
Corinthian ...	...	Voided leases	...	...	...	...	...	...	...	134,508·00	29,324·83	...
Do. ...	...	Sundry claims	...	...	72·00	35·87	...	...	...	176·50	113·22	...
Ennuin ...	...	Voided leases	...	...	...	...	...	...	...	134·56	361·34	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	131·50	104·05	...
Forrestonia ...	...	Voided leases	...	...	...	...	...	...	...	1,185·00	298·15	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	327·00	114·95	...
Golden Valley	3311	Great Bingin	...	...	71·75	82·66	...	...	...	93·75	90·12	...
Do. ...	8PP	Magpie	...	...	...	...	...	...	...	16·25	10·68	...
Do. ...	2994	Radio	...	2·70	547·00	1,904·65	...	...	2·70	6,477·80	19,932·34	7·43
Do. ...	3248	Radio Deeps	...	...	164·83	548·29	...	...	...	774·83	1,694·09	...
Do. ...	...	Voided leases	...	...	...	...	...	...	18·05	8,438·74	8,777·79	2·00
Do. ...	...	Sundry claims	...	...	46·25	22·61	...	...	2·75	2,536·97	2,413·60	...
Greenmount	...	Voided leases	...	...	...	...	...	45·99	21·62	124,803·64	31,527·40	944·50
Do. ...	...	Sundry claims	...	...	...	...	...	...	4·12	875·00	334·48	...
Holleton ...	3312	Glenelg Queen	...	...	...	...	...	...	...	211·00	495·54	...
Do. ...	3280	Hollow and Heaton's Reward...	...	...	...	...	...	...	9·33	21·50	127·55	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	23·00	19·35	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	36·50	34·99	...
Hope's Hill ...	...	Voided leases	...	...	...	...	...	...	74·78	130,295·05	35,815·85	1·00
Do. ...	...	Sundry claims	...	...	191·40	49·42	...	...	25·38	1,910·15	625·93	...
Kennyville ...	...	Voided leases	...	...	...	...	...	...	18·76	32,377·13	15,222·68	·59
Do. ...	...	Sundry claims	...	...	...	...	...	...	5·06	2,068·50	912·84	...

Koolyanobbing	...	Voided leases	...	...	...	...	...	...	...	308·00	116·74	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	55·00	11·24	...
Marvel Loch...	3369	Centenary	...	...	·10	14·57	...	...	...	·10	14·57	...
Do. ...	(3277)	Just in Time	...	...	...	...	...	...	...	5,957·00	1,354·87	...
Do. ...	852	May Queen	...	...	124·00	329·59	...	...	4·07	1,722·50	6,503·66	...
Do. ...	...	Voided leases	...	...	...	...	...	...	104·39	470,875·26	133,135·00	771·03
Do. ...	...	Sundry claims	1·77	3·13	40·00	41·01	...	10·64	87·95	11,801·74	6,049·25	...
Mount Jackson	...	Voided leases	...	...	...	...	...	...	114·88	37,186·03	27,676·47	2,305·28
Do. ...	...	Sundry claims	...	...	...	...	...	5·71	30·46	1,697·00	1,177·74	·74
Mt. Rankin ...	...	Voided leases	...	...	...	...	...	3·84	5·20	496·00	122·17	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	170·00	54·38	...
Parker's Range	2801	Scots Greys	...	...	...	...	...	...	...	1,516·00	561·08	...
Do. ...	3365	White Horse	...	...	94·00	80·81	...	...	...	179·00	178·62	...
Do. ...	...	Voided leases	...	...	...	...	...	...	105·14	35,511·25	19,382·17	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	2,344·25	1,597·03	...
Southern Cross	...	Voided leases	...	...	...	...	...	2·13	211·22	434,105·88	212,008·46	364·41
Do. ...	...	Sundry claims	1·02	...	70·75	68·67	...	6·52	595·45	4,437·48	1,522·20	...
Weston's ...	3308	Consolidated: McCahon's Gold Mines, N.L.	...	...	370·00	226·58	...	...	...	370·00	226·58	...
Do. ...	3308	(Consolidated)	...	...	...	...	...	...	...	1,797·00	1,497·95	...
Do. ...	3310	Les Trois	...	...	540·00	375·60	...	...	...	844·00	632·37	...
Do. ...	...	Voided leases	...	...	...	...	...	...	4·06	422,777·99	299,668·10	21·78
Do. ...	...	Sundry claims	...	4·51	133·25	57·02	...	...	57·42	1,592·10	1,452·40	...
	From Goldfields generally :—											
	Sundry Parcels treated at :											
	Berrigan and Jones' Cyanide Works		...	...	...	645·58	...	...	...	...	1,358·04	...
	Glideaway Battery		...	...	...	...	...	...	...	...	250·87	...
	Great Victoria Cyanide Works		...	...	...	...	...	...	...	...	5,847·54	...
	Howlett's Battery		...	...	...	52·20	...	...	...	10·00	1,787·13	...
	Spring Hill Works		...	...	...	...	...	...	...	...	854·27	...
	Sunbeam Battery		...	...	...	...	...	...	...	38·50	7,244·60	...
	Various Works		...	...	...	...	...	...	...	118·28	28,858·43	36·54
	Reported by Banks and Gold Dealers		...	...	...	...	...	23·65	3·53	...	...	...
	Total		**2·79**	**10·34**	**2,985·83**	**4,687·68**	**...**	**102·19**	**1,556·71**	**2,367,982·94**	**1,090,174·76**	**32,288·71**

Dundas Goldfield.

Buldania ...	...	Voided leases	...	...	...	...	...	...	3·02	846·05	708·99	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	36·53	341·27	519·77	...
Dundas ...	...	Voided leases	...	...	...	...	...	...	...	4,543·23	2,208·48	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	385·37	182·50	143·88	...
Killaloe ...	...	Voided leases	...	...	...	...	...	...	...	20·65	6·88	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

DUNDAS GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1929.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Norseman ...	1291	Mararoa No. 1	...	...	1,000·00	425·60	...	...	...	10,566·96	7,904·83	...
Do. ...	1290	Mararoa No. 2	...	...	...	...	...	...	...	436·50	285·39	...
Do. ...	1288	Mararoa No. 3	...	...	...	...	...	...	...	1,026·25	1,382·14	...
Do. ...	1315	New Mararoa	...	...	...	...	...	...	...	682·50	188·50	...
Do. ...	1317	O.K.	...	...	400·25	570·32	...	...	8·34	808·75	1,152·48	...
Do. ...	990	Viking No. 1	...	...	403·00	169·31	...	...	42·44	1,387·05	2,273·47	...
Do. ...	990	(Viking No. 1)	...	...	...	...	...	...	...	1,274·00	3,095·95	...
Do. ...	990, (1060) ...	(Viking No. 1 Leases)	...	...	...	...	...	...	...	775·50	1,176·13	16·89
Do. ...	990, (1016), (1060), (1117), (1181), (1194), (1235)	(Viking No. 1 Leases)	...	...	...	...	...	...	...	48,452·00	44,457·70	242·83
Do. ...	...	Voided leases	...	...	...	...	...	4·23	10,415·94	821,517·77	526,246·91	34,600·73
Do. ...	...	Sundry claims	...	57·95	1,236·75	425·82	...	1,013·97	3,146·19	23,719·46	13,470·33	·59
Peninsula ...	...	Voided leases	...	...	...	...	...	...	17·61	7,807·14	4,833·88	...
	From District generally :—											
	Sundry Parcels treated at :											
	Rawlings and Bullens' Works		...	...	...	...	...	...	...	57·39	4,266·10	...
	State Battery, Norseman		...	...	...	...	...	...	...	405·14	14,143·21	885·41
	Various Works		...	...	...	...	...	...	54·52	425·75	6,562·86	646·45
	Reported by Banks and Gold Dealers		2·36	...	...	...	...	1,037·55	...	...	1·04	...
		Total	**2·36**	**57·95**	**3,040·00**	**1,591·05**	**...**	**2,055·75**	**14,109·96**	**925,275·86**	**635,028·92**	**36.392·90**

Phillips River Goldfield.

Hatter's Hill...	...	Sundry claims	...	...	...	...	...	...	1·49	40·00	14·98	...
Kundip ...	202	Fair Play	...	...	110·00	51·79	...	...	...	110·00	51·79	...
Do. ...	184	Gem	...	...	...	49·47	...	...	...	4,159·15	3,374·33	...
Do. ...	M.L. 52, M.L. 94	Harbour View Gold & Copper Co., Ltd.	...	...	...	...	...	...	...	1,602·89	1,836·05	360·11
Do. ...	M.L. 52, M.L. 94	(Harbour View leases)	...	...	...	...	...	...	379·86	3,619·25	1,560·86	61·41
Do. ...	M.L. 52, M.L. 94	(Harbour View leases)	...	...	...	...	...	...	...	3,403·50	2,227·62	1·88
Do. ...	M.L. 370 ...	North Harbour View	...	...	...	...	...	...	...	35·27	22·16	...
Do. ...	M.L. 52, M.L. 74	(Ravensthorpe G.M. Syndicate, N.L.)	...	...	...	...	...	...	...	1,124·00	433·94	164·98
Do. ...	...	Voided leases	...	...	...	...	...	113·28	176·31	53,187·52	46,577·82	3,208·86
Do. ...	...	Sundry claims	...	...	139·00	88·46	...	84·05	71·58	1,215·88	747·47	15·45

Mt. Desmond	...	Voided leases	...	...	...	...	...	...	1·40	9·00	3,905·46	6,891·59
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	...	32·81	51·01
Mt. Purchas...	...	Voided leases	...	...	...	...	...	...	4·38	346·05	293·13	...
Do. ...	...	Sundry claims	...	...	...	..	...	...	...	4·75	4·68	...
Ravensthorpe	...	Voided leases	...	...	...	...	...	...	141·80	21,933·76	25,149·50	4,384·07
Do. ...	...	Sundry claims	...	...	...	...	...	163·96	6·60	2,268·18	1,628·83	20·65
West River ...	...	Voided leases	...	...	...	...	...	...	...	...	10·34	31·06
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	...	3·29	3·44
	From Goldfield generally :—											
	Sundry Parcels treated at :											
	Gem Battery		...	...	...	...	...	...	...	...	138·89	...
	Phillips River Smelter		...	...	...	...	...	...	...	...	385·96	493·66
	Two Boys Works		...	...	...	...	...	...	...	...	100·95	...
	Various Works		...	...	...	...	...	...	...	...	4·76	...
	Reported by Banks and Gold Dealers		...	...	...	...	...	122·48	...	...	...	...
		Total	...	...	**249·00**	**189·72**	...	**483·77**	**783·42**	**93,059·20**	**88,505·62**	**15,688·17**

Donnybrook Goldfield.

Donnybrook ...	...	Voided leases	...	...	...	...	...	23·24	...	1,613·30	816·23	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	40·00	2·29	...
		Total	...	...	...	...	...	**23·24**	...	**1,653·30**	**818·52**	...

State generally.

Burracoppin...	...	Sundry claims	...	...	...	...	...	...	...	9·00	10·20	...
Jimbel Bar ...	...	Voided leases	...	...	...	...	...	...	111·08	...	...	·58
Do. ...	...	Sundry claims	...	...	...	...	...	...	10·20	...	...	...
Narra Tarra...	Loc. 833 ...	Narra Tarra : Fremantle Trading Co., Ltd.	...	...	...	...	...	...	...	...	91·51	20,718·76
	From State generally :—											
	Sundry Parcels treated at :											
	Hainault Sulphide Plant, Kalgoorlie		...	...	...	...	...	...	...	...	21·28	...
	State Smelter, Ravensthorpe		...	...	...	...	...	...	...	...	41·20	...
	Various Works		...	...	...	...	...	...	...	27·00	7,711·30	10,157·20
	Sundry Specimens		...	...	...	...	...	4·24	56·85	...	...	...
	Reported by Banks and Gold Dealers		...	...	...	...	...	150·21	183·87	...	...	...
		Total	...	...	...	...	...	**154·45**	**362·00**	**36·00**	**7,875·49**	**30,876·54**

TABLE V.

TOTAL OUTPUT OF GOLD BULLION ENTERED FOR EXPORT, AND RECEIVED AT THE PERTH BRANCH OF THE ROYAL MINT, FROM 1ST JANUARY, 1886, TO 31ST DECEMBER, 1929, SHOWING, IN FINE OUNCES, THE QUANTITY OBTAINED FROM THE RESPECTIVE GOLDFIELDS, AND THE TOTAL ANNUAL VALUE.

Year	KIMBERLEY.			PILBARA.			*a* WEST PILBARA.			ASHBURTON.		
	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.
Previous to 1929	22,422·06	7,250·26	29,672·32	147,302·43	158,615·16	305,917·59	4,351·11	26,596·82	30,947·93	4,104·96	2,230·04	6,335·00
1929 ...	...	184·27	184·27	...	2,320·18	2,320·18	...	50·14	50·14	...	8·66	8·66
Total ...	22,422·06	7,434·53	29,856·59	147,302·43	160,935·34	308,237·77	4,351·11	26,646·96	30,998·07	4,104·96	2,238·70	6,343·66

Year.	*b* GASCOYNE.			*c* PEAK HILL			*c* EAST MURCHISON.			MURCHISON.		
	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total	Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.
Previous to 1929	304·55	791·47	1,096·02	41,102·62	176,422·25	217,524·87	230,585·11	1,422,660·63	1,653,245·74	1,449,310·77	2,051,271·72	3,500,582·49
1929 ...	...	10·17	10·17	...	1,061·84	1,061·84	13·25	3,802·55	3,815·80	907·78	21,445·24	22,353·02
Total ...	304·55	801·64	1,106·19	41,102·62	177,484·09	218,586·71	230,598·36	1,426,463·18	1,657,061·54	1,450,218·55	2,072,716·96	3,522,935·51

Year.	*d* YALGOO.			*e* MT. MARGARET.			*f* NORTH COOLGARDIE.			*g* BROAD ARROW.		
	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.
Previous to 1929	11,478·21	100,984·24	112,462·45	607,503·15	2,732,723·60	3,340,226·75	261,964·27	1,719,343·31	1,981,307·58	121,620·16	216,897·61	338,517·77
1929 ...	...	2,934·35	2,934·35	245·31	33,549·89	33,795·20	140·83	2,412·45	2,553·28	...	8,185·10	8,185·10
Total ..	11,478·21	103,918·59	115,396·80	607,748·46	2,766,273·49	3,374,021·95	262,105·10	1,721,755·76	1,983,860·86	121,620·16	225,082·71	346,702·87

Year.	*f* NORTH-EAST COOLGARDIE.			*f* EAST COOLGARDIE.			*h* COOLGARDIE.			YILGARN.		
	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.
Previous to 1929	235,179·30	438,730·04	673,909·34	6,798,719·69	14,974,130·02	21,772,849·71	661,495·66	859,870·18	1,521,365·84	215,873·72	964,701·24	1,180,574·96
1929 ...	203·92	248·65	452·57	1,493·65	288,406·43	289,900·08	13·21	2,153·57	2,166·78	19·17	4,359·27	4,378 44
Total ...	235,383·22	438,978·69	674,361·91	6,800,213·34	15,262,536·45	22,062,749·79	661,508·87	862,023·75	1,523,532·62	215,892·89	969,060·51	1,184,953·40

Year.	*i* DUNDAS.			*j* PHILLIPS RIVER.			¶ DONNYBROOK.			STATE GENERALLY.		
	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.
Previous to 1929	113,896·47	610,589·41	724,485·88	39,035·37	42,956·99	81,992·36	282·21	557·53	839·74	18,025·44	18,391·11	36,416·55
1929 ...	...	2,418·74	2,418·74	...	527·65	527·65	...	...	...	...	59·81	59·81
Total ...	113,896·47	613,008·15	726,904·62	39,035·37	43,484·64	82,520·01	282·21	557·53	839·74	18,025·44	18,450·92	36,476·36

a Prior to 1st May, 1898, included with Pilbara. *b* Prior to March, 1899, included with Ashburton. *c* From 1st August, 1897.
d Prior to 1st April, 1897, included with Murchison. *e* From 1st August, 1897. *f* Prior to 1st May, 1896, included with Coolgardie.
g From 1st September, 1897. *h* Declared 5th April, 1894, to which date included with Yilgarn.
i Prior to 1893 included with Yilgarn. *j* Prior to 1902, included in State generally. ¶ Abolished 4th March, 1908.

Total Output of Gold Bullion entered for Export, and Received at the Perth Branch of the Royal Mint, etc.

Year.	GRAND TOTAL.				
	Export.	Mint.	Total.	Value.	
	fine ozs.	fine ozs.	fine ozs.	£ s. d.	
1886	270·17	...	270·17	1,147 12 2½	
1887	4,359·37	...	4,359·37	18,517 8 6½	
1888	3,124·82	...	3,124·82	13,273 7 10½	
1889	13,859·52	...	13,859·52	58,871 9 11½	
1890	20,402·42	...	20,402·42	86,663 19 5	
1891	27,116·14	...	27,116·14	115,182 0 10½	
1892	53,271·65	...	53,271·65	226,283 11 8	
1893	99,202·50	...	99,202·50	421,385 8 8½	
1894	185,298·73	...	185,298·73	787,098 19 6	
1895	207,110·20	...	207,110·20	879,748 4 2½	
1896	251,618·69	...	251,618·69	1,068,808 5 2	
1897	603,846·44	...	603,846·44	2,564,976 12 9½	
1898	939,489·49	...	939,489·49	3,990,697 13 10	
1899	1,283,360·25	187,244·41	1,470,604·66	6,246,731 10 7½	
1900	894,387·27	519,923·59	1,414,310·86	6,007,610 13 4½	
1901	923,686·96	779,729·56	1,703,416·52	7,235,653 9 1	
1902	707,039·75	1,163,997·60	1,871,037·35	7,947,661 9 7½	
1903	833,685·78	1,231,115·62	2,064,801·40	8,770,718 17 0½	
1904	810,616·04	1,172,614·03	1,983,230·07	8,424,225 17 3½	
1905	655,089·88	1,300,226·00	1,955,315·88	8,305,653 18 5½	
1906	562,250·59	1,232,296·01	1,794,546·60	7,622,749 8 7	
1907	431,803·14	1,265,750·45	1,697,553·59	7,210,749 6 2½	
1908	356,353·96	1,291,557·17	1,647,911·13	6,999,881 10 10½	
1909	386,370·58	1,208,898·83	1,595,269·41	6,776,273 14 7½	
1910	233,970·34	1,236,661·68	1,470,632·02	6,246,847 15 0	
1911	160,422·28	1,210,445·24	1,370,867·52	5,823,075 1 9½	
1912	83,577·12	1,199,080·87	1,282,657·99	5,448,384 16 5½	
1913	86,255·13	1,227,788·15	1,314,043·28	5,581,701 1 2½	
1914	51,454·65	1,181,522·17	1,232,976·82	5,237,352 12 6½	
1915	17,340·47	1,192,771·23	1,210,111·70	5,140,227 15 5½	
1916	26,742·17	1,034,655·87	1,061,398·04	4,508,532 5 11	
1917	9,022·49	961,294·67	970,317·16	4,121,645 6 2½	
1918	15,644·12	860,867·03	876,511·15	3,723,182 14 9	
1919	6,445·89	727,619 90	734,065·79	3,118,113 5 6½	
1920	5,261·13	612,581·00	617,842·13	2,624,426 11 0	
1921	7,170·74	546,559·92	553,730·66	2,352,098 6 8½	
1922	5,320·16	532,926·12	538,246·28	2,286,324 17 5	
1923	5,933·82	498,577·59	504,511·41	2,143,028 5 0½	
1924	2,585·20	482,449·78	485,034·98	2,060,297 12 8½	
1925	3,910·59	437,341·56	441,252·15	1,874,319 19 10½	
1926	3,188·22	434,154·98	437,343·20	1,857,715 16 7	
1927	3,359·10	404,993·41	408,352·51	1,734,571 4 1½	
1928	3,339·30	390,069.19	393,408·49	1,671,093 1 0	
1929	3,037·12	374,138·96	377,176·08	1,602,142 3 10	
Total	10,987,594·38	26,899,852·59	37,887,446·97	160,935,645 3 8½	

PART II.—MINERALS OTHER THAN GOLD.

TABLE VI.—GENERAL RETURN OF ORE AND MINERALS, OTHER THAN GOLD, SHOWING THE QUANTITY PRODUCED AND THE VALUE THEREOF AS REPORTED TO THE MINES DEPARTMENT FROM THE RESPECTIVE GOLDFIELDS AND MINERAL FIELDS, DURING 1929, AND PREVIOUS YEARS.

BLACK TIN.

Period.	Pilbara Goldfield—Marble Bar District.				Greenbushes Mineral Field.				Total.			
	Quantity.			Value.	Quantity.			Value.	Quantity.			Value.
	Lode.	Stream.	Total.		Lode.	Stream.	Total.		Lode.	Stream	Total.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Previous to 1917* ...	362·87	4,982·17	5,345·04	460,540	244·53	9,465·12	9,709·65	754,309	607·40	14,452·16	15,059·56	1,215,224
1917	4·05	65·00	69·05	9,264	11·18	226·74	237·92	29,928	15·23	291·74	306·97	39,192
1918	5·70	93·80	99·50	20,984	50·52	245·28	295·80	57,653	56·22	339·08	395·30	78,637
1919	...	36·70	36·70	5,871	23·66	220·95	244·61	34,959	23·66	257·65	281·31	40,830
1920	...	41·50	41·50	7,616	10·25	179·84	190·09	31,249	10·25	221·34	231·59	38,865
1921	...	14·50	14·50	1,460	7·00	45·87	52·87	5,778	7·00	60·37	67·37	7,238
1922	...	25·35	25·35	2,446	·15	15·71	15·86	1,393	·15	41·06	41·21	3,839
1923	...	24·40	24·40	2,960	...	28·02	28·02	3,024	...	52·42	52·42	5,984
1924	...	28·55	28·55	4,048	·32	52·24	52·56	7,469	·32	80·79	81·11	11,517
1925	...	23·96	23·96	3,609	1·21	54·06	55·27	8,764	1·21	78·02	79·23	12,373
1926	...	35·42	35·42	5,446	...	61·41	61·41	10,126	...	96·83	96·83	15,572
1927	...	37·44	37·44	6,229	1·23	57·11	58·34	9,544	1·23	94·55	95·78	15,773
1928	...	35·48	35·48	5,171	...	54·54	54·54	6,355	...	90·02	90·02	11,526
1929	...	17·86	17·86	2,531	·91	37·39	38·30	4,079	·91	55·25	56·16	6,610
Total	372·62	5,462·13	5,834·75	538,175	350·96	10,744·28	11,095·24	964,630	723·58	16,211·28	16,934·86	1,503,180

* Includes 4·72 tons value £360 the produce of Cue District and ·15 tons value £15 the produce of Coolgardie District.

TANTALITE.

Period.	Pilbara Goldfield—Marble Bar District.				Greenbushes Mineral Field.				Total.			
	Quantity.			Value.	Quantity.			Value.	Quantity.			Value.
	Lode.	Stream.	Total.		Lode.	Stream.	Total.		Lode.	Stream.	Total.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Previous to 1917 ...	2·25	83·80	86·05	11,682	...	3·19	3·19	1,804	2·25	86·99	89·24	13,486
1917	...	12·50	12·50	1,782	...	...	...	...	...	12·50	12·50	1,782
1918	...	...	...	...	...	...	...	...	...	...	...	...
1919	...	...	...	...	...	...	..	...	...	..	...	...
1920	...	...	...	...	...	...	...	...	...	...	...	...
1921	...	...	...	...	...	...	...	...	...	...	...	...
1922	...	...	...	...	...	...	...	...	...	...	...	...
1923	...	...	...	...	...	...	...	...	...	...	...	...
1924	...	...	...	...	...	...	...	...	...	...	...	...
1925	...	6·25	6·25	750	...	...	...	...	...	6·25	6·25	750
1926	...	19·45	19·45	2,357	...	...	...	...	...	19·45	19·45	2,357
1927	...	15·28	15·28	3,808	...	...	...	...	...	15·28	15·28	3,808
1928	...	8·76	8·76	2,213	...	...	...	...	...	8·76	8·76	2,213
1929	...	11·27	11·27	3,598	...	·30	·30	70	...	11·57	11·57	3,668
Total	2·25	157·31	159·56	26,190	...	3·49	3·49	1,874	2·25	160·80	163·05	28,064

Period.	PYRITIC ORE.		COPPER ORE.													
	Mt. Margaret G.F.		West Kimberley Goldfield		Pilbara Goldfield.				West Pilbara Gf.		Ashburton Gf.		Peak Hill Gf.		E. Murchison Gf.	
	Mt. Morgans D.				Marble Bar D.		Nullagine D.								Lawlers D.	
	Quantity.	Value.‖	Q'ntity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1917 ...	tons. 48,506·57	£ 17,846	tons. 109·52	£ 1,709	tons. 32·87	£ 386	tons. 5·00	£ 120	tons. 75,822·87	£ 631,901	tons. 347·36	£ 6,341	tons. 601·21	£ 18,295	tons. 81·12	£ 1,527
1917 ...	3,575·46	1,752	...	...	...	...	...	...	783·61	13,406	3·71	67	287·84	9,683	75·00	1,523
1918 ...	2,251·81	1,629	...	...	...	...	...	...	1,844·19	28,961	...	...	76·28	2,480	82·44	1,314
1919 ...	4,135·93	4,919	...	...	...	...	...	...	1,030·78	15,807	...	...	14·39	353	...	...
1920 ...	6,019·98	7,276	...	...	...	...	9·00	360	1,700·50	32,059	...	...	35·39	1,401	...	...
1921 ...	6,116·66	7,871	...	...	...	...	...	...	1,055·00	18,955	...	...	...	...	...	...
1922 ...	3,441·15	4,203	...	...	...	...	...	...	164·00	2,481	...	...	...	...	...	...
1923 ...	...	...	...	...	...	...	...	...	221·00	3,500	...	...	...	...	...	...
1924 ...	...	...	...	...	...	...	...	...	79·00	1,012	...	...	...	...	...	...
1925 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1926 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1927 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1928 ...	...	...	...	...	...	...	...	...	45·00	400	...	...	...	...	...	...
1929 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	74,047·56	45,496	109·52	1,709	32·87	386	14·00	480	82,745·45	748,482	351·07	6,408	1,015·11	32,212	238·56	4,364

‖ Represents the value of the sulphur only, the copper contents not having been treated yet.

Period.	COPPER ORE—*continued.*															
	Murchison Gf.				Yalgoo Gf.		Northampton Mf.		Yandanooka Mf.		Mt. Margaret Goldfield.					
	Meekatharra D.		Day Dawn D.								Mt. Morgans District.		Mt. Margaret District.			
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£		
Previous to 1917	790·39	6,379	55·56	522	38·40	413	136·50	1,992	171·55	1,889	47,857·67	230,820	2·85	26		
1917	82·92	2,164	...	...	...	...	...	...	...	...	...	...	...	...		
1918	78·34	1,794	...	...	...	...	...	...	...	...	...	...	...	...		
1919	18·81	377	...	...	...	...	...	...	...	...	...	...	...	...		
1920	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
1921	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
1922	...	...	...	...	...	...	998·66	13,435	...	...	...	...	...	...		
1923	...	...	...	...	...	...	9,626·29	59,143	...	...	...	...	...	...		
1924	...	...	...	...	...	...	10,672·00	34,955	...	...	...	...	...	...		
1925	...	...	...	...	...	...	2,469·72	8,952	...	...	...	...	...	...		
1926	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
1927	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
1928	...	...	...	...	...	...	...	...	...	...	...	...	...	...		
1929	...	...	...	...	...	...	116·00	974	...	...	...	...	...	...		
Total ...	968·46	10,714	55·56	522	38·40	413	24,019·17	119,451	171·55	1,889	47,857·67	230,820	2·85	26		

TABLE VI.—*Minerals other than Gold, etc.*—continued.

COPPER ORE—*continued.*

Period.	North Coolgardie Goldfield. Menzies District.		East Coolgardie Goldfield. E. Coolgardie D.		Phillips River Goldfield.		State generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1917 ...	tons. 6·12	£ 51	tons. 50·67	£ 330	tons. 86,947·55	£ 466,722	tons. 18·61	£ 249	tons. 213,075·32	£ 1,369,672
1917 ...	...	...	...	...	5,255·57	66,868	...	...	6,488·65	93,711
1918 ...	...	...	...	...	2,901·66	42,978	...	...	4,982·91	77,527
1919 ...	...	...	...	...	215·02	4,993	...	...	1,277·00	21,530
1920 ...	...	...	...	...	217·27	4,125	...	...	1,962·16	37,945
1921 ...	...	...	...	...	95·34	1,207	...	...	1,150·34	20,162
1922 ...	...	...	...	...	31·84	217	...	...	1,194·50	16,133
1923 ...	...	...	...	...	26·01	541	...	...	9,873·30	63,184
1924 ...	...	...	...	...	3·69	44	...	...	10,754·69	36,011
1925 ...	...	...	...	...	...	...	...	...	2,469·72	8,952
1926 ...	...	...	...	...	...	...	...	...	...	...
1927 ...	...	...	...	...	...	...	...	...	...	...
1928 ...	...	...	...	...	...	...	...	...	45·00	400
1929 ...	...	...	...	...	33·18	420	...	...	149·18	1,394
Total ...	6·12	51	50·67	330	95,727·13	588,115	18·61	249	253,422·77	1,746,621

GYPSUM.

Period.	Yilgarn Goldfield.		State generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1917 ...	tons.	£	tons.	£	tons.	£
1917 ...	...	...	...	...	...	...
1918 ...	...	...	...	...	...	...
1919 ...	...	...	...	...	...	...
1920 ...	...	...	...	...	...	...
1921 ...	...	...	664·50	622	664·50	622
1922 ...	...	...	63·00	16	63·00	16
1923 ...	...	...	...	...	...	...
1924 ...	...	...	4,237·00	5,278	4,237·00	5,278
1925 ...	...	...	3,059·95	4,118	3,059·95	4,118
1926 ...	139·00	139	3,778·76	5,479	3,917·76	5,618
1927 ...	698·25	698	5,976·25	9,120	6,674·50	9,818
1928 ...	1,214·00	1,214	3,000·00	4,211	4,214·00	5,425
1929 ...	761·00	761	4,528·00	6,915	5,289·00	7,676
Total ...	2,812·25	2,812	25,307·46	35,759	28,119·71	38,571

IRONSTONE.

Period.	W. Pilbara Gf.		E. Coolgardie Gf. E. Coolgardie D.		State generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1917 ...	tons. 100·00	£ 300	tons. 450·00	£ 247	tons. 57,280·00	£ 36,148	tons. 57,830	£ 36,695
1917 ...	...	...	...	...	...	...	...	...
1918 ...	...	...	...	...	...	...	...	...
1919 ...	...	...	...	...	...	...	...	...
1920 ...	...	...	...	...	...	...	...	...
1921 ...	...	...	...	...	...	...	...	...
1922 ...	...	...	...	...	...	...	...	...
1923 ...	...	...	...	...	...	...	...	...
1924 ...	...	...	...	...	...	...	...	...
1925 ...	...	...	...	...	...	...	...	...
1926 ...	...	...	...	...	...	...	...	...
1927 ...	...	...	...	...	...	...	...	...
1928 ...	...	...	...	...	...	...	...	...
1929 ...	...	...	...	...	...	...	...	...
Total ...	100·00	300	450·00	247	57,280·00	36,148	57,830·00	36,695

LEAD ORE.

Period.	Northampton Mf.		West Pilbara Gf.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1917 ...	tons. 112,076·90	£ 274,979	tons. 44·00	£ 770	tons. 112,120·90	£ 275,749
1917 ...	46,801·97	143,925	62·57	759	46,864·54	144,684
1918 ...	47,079·68	176,330	...	...	47,079·68	176,330
1919 ...	7,385·70	29,841	...	...	7,385·70	29,841
1920 ...	27,716·40	172,483	...	...	27,716·40	172,483
1921 ...	10,330·43	25,649	...	...	10,330·43	25,649
1922 ...	29,602·90	72,338	...	...	29,602·90	72,338
1923 ...	21,634·50	59,194	...	...	21,634·50	59,194
1924 ...	36,750·00	101,219	...	...	36,750·00	101,219
1925 ...	37,865·99	119,299	...	...	37,865·99	119,299
1926 ...	23,973·35	72,872	...	...	23,973·35	72,872
1927 ...	5,809·50	17,347	...	...	5,809·50	17,347
1928 ...	112·00	315	...	...	112·00	315
1929 ...	1,075·00	3,767	...	...	1,075·00	3,767
Total ...	408,214·32	1,269,558	106·57	1,529	408,320·89	1,271,087

SILVER LEAD ORE.

Period.	Pilbara Goldfield. Marble Bar District.		Ashburton Gfd.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1917 ...	tons.	£	tons. 2,431·54	£ 27,410	tons. 2,431·54	£ 27,410
1917 ...	...	...	...	...	...	...
1918 ...	...	...	237·48	3,461	237·48	3,461
1919 ...	...	...	214·76	3,116	214·76	3,116
1920 ...	...	...	...	...	...	...
1921 ...	...	...	...	...	...	...
1922 ...	...	...	...	...	...	...
1923 ...	...	...	...	...	...	...
1924 ...	...	...	...	...	...	...
1925 ...	51·00	1,268	30·00	630	81·00	1,898
1926 ...	90·50	1,305	...	...	90·50	1,305
1927 ...	36·00	792	60·00	1,179	96·00	1,971
1928 ...	17·85	293	...	...	17·85	293
1929 ...	...	...	...	...	...	...
Total ...	195·35	3,658	2,973·78	35,796	3,169·13	39,454

TUNGSTEN ORES.

Period.	Wolfram. State generally.		Scheelite. North Coolgardie Gf. Menzies District.		Broad Arrow Goldfield.		Coolgardie Gf. Coolgardie District.		Dundas Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1917 ...	tons. 265·89	£ 1,295	tons. ...	£ ...	tons. ...	£ ...	tons. ...	£ ...	tons. ...	£ ...	tons. ...	£ ...
1917 ...	...	...	...	...	...	...	...	...	...	...	...	...
1918 ...	...	...	...	...	...	...	...	...	...	...	...	...
1919 ...	...	...	273·06	829	...	...	45·71	101	...	...	318·77	930
1920 ...	...	...	134·25	113	3·35	175	40·00	54	·41	10	178·01	352
1921 ...	...	...	...	...	...	...	...	...	...	...	...	...
1922 ...	...	...	...	...	...	...	...	...	...	...	...	...
1923 ...	...	...	...	...	...	...	...	...	...	...	...	...
1924 ...	...	...	...	...	...	...	...	...	...	...	...	...
1925 ...	...	...	...	...	...	...	...	...	...	...	...	...
1926 ...	...	...	...	...	...	...	...	...	...	...	...	...
1927 ...	...	...	...	...	...	...	...	...	...	...	...	...
1928 ...	...	...	...	...	...	...	...	...	...	...	...	...
1929 ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	265·89	1,295	407·31	942	3·35	175	85·71	155	·41	10	496·78	1,282

COAL.

Period.	Collie Mf.	
	Quantity.	Value.
Previous to 1917	tons. 3,544,356·95	£ 1,657,415
1917	326,550·07	191,822
1918	337,039·24	204,319
1919	401,713·18	270,355
1920	462,020·78	350,346
1921	468,816·65	407,117
1922	438,442·78	381,555
1923	420,713·98	368,949
1924	421,863·86	363,255
1925	437,461·20	363,203
1926	474,818·69	394,400
1927	501,504·95	407,967
1928	528,420·00	420,145
1929	544,718·60	426,706
Total ...	9,308,440·93	6,207,554

FIRECLAY.

Period.	Collie Mf.	
	Quantity.	Value.
Previous to 1917	tons.	£
1917	...	...
1918	...	...
1919	...	...
1920	...	...
1921	677·80	646
1922	...	...
1923	...	...
1924	...	...
1925	...	...
1926	...	...
1927	...	...
1928	373·00	92
1929	...	...
Total ...	1,050·80	738

GADOLINITE.

Period.	Pilbara Gf. Marble Bar D.	
	Quantity.	Value.
Previous to 1917	tons. 1·00	£ 112
1917	...	...
1918	...	...
1919	...	...
1920	...	...
1921	...	...
1922	...	...
1923	...	...
1924	...	...
1925	...	...
1926	...	...
1927	...	...
1928	...	...
1929	...	...
Total ...	1·00	112

ASBESTOS.

Period.	Pilbara Gf. Marble Bar D.		Pilbara Gf. Nullagine D.		West Pilbara Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1917	tons. 42·83	£ 1,754	tons. ...	£ ...	tons. ...	£ ...	tons. 42·83	£ 1,754
1917	...	...	...	...	...	...	...	...
1918	...	...	...	...	...	...	...	...
1919	...	...	53·00	1,443	...	...	53·00	1,443
1920	32·00	1,900	124·50	5,386	...	...	156·50	7,286
1921	32·60	1,360	202·75	12,221	...	...	235·35	13,581
1922	2·50	250	179·18	7,350	...	...	181·68	7,600
1923	3·00	150	111·00	3,865	·85	17	114·85	4,032
1924	...	...	73·58	2,206	...	...	73·58	2,206
1925	...	...	50·00	1,619	·74	22	50·74	1,641
1926	...	...	91·45	2,436	13·89	292	105·34	2,728
1927	...	...	10·80	304	...	...	10·80	304
1928	5·70	600	6·00	182	...	...	11·70	782
1929	63·70	6,113	...	...	191·25	8,568	254·95	14,681
Total ...	182·33	12,127	902·26	37,012	206·73	8,899	1,291·32	58,038

TABLE VI.—*Minerals other than Gold, etc.*—continued.

Period.	LIMESTONE.								DIAMONDS.		EMERALDS.		MAGNESITE.		ANTIMONY.		MANGANESE.	
	Murchison Gf. Cue District.		Yilgarn Goldfield.		State generally.		Total.		Pilbara Gf. Nullagine District.		Murchison Gf. Cue District.		E. Coolgardie Goldfield. Bulong District.		West Pilbara Goldfield.		Peak Hill Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	carats.	£	carats. cut and rough	£	tons.	£	tons.	£	tons.	£
Previous to 1917 ...	298·00	772	2,548·85	1,607	90,858·88	15,911	93,705·73	18,290	...	24	...	...	699·00	698	20·78	491	...	...
1917 ...	...	...	...	...	...	...	...	...	...	...	...	...	20·50	21	...	...	...	...
1918 ...	...	...	...	...	...	...	...	...	...	...	...	...	105·25	334	...	...	...	...
1919 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1920 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1921 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1922 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18·11	142
1923 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1924 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	58·63	294
1925 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1926 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1927 ...	...	...	...	...	...	...	...	...	...	...	200·00	421	...	...	...	...	...	...
1928 ...	...	...	...	...	...	...	...	...	...	...	17,564·00	910	...	...	...	...	...	...
1929 ...	...	...	...	...	...	...	...	...	...	...	609·00	278	...	...	...	...	...	...
Total ...	**298·00**	**772**	**2,548·85**	**1,607**	**90,858·88**	**15,911**	**93,705·73**	**18,290**	**...**	**24**	**18,373·00**	**1,609**	**824·75**	**1,053**	**20·78**	**491**	**76·74**	**436**

NOTE.—As the collection of Statistics of Minerals other than Gold commenced during 1899, the total production from the different localities can only be approximately estimated by the Customs Records, the latest available returns of which are to be found in Table XXVI., page 64.

TABLE VII.

QUANTITY AND VALUE OF BLACK TIN REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929. Quantity. Lode.	1929. Quantity. Stream.	1929. Quantity. Total.	1929. Value.	TOTALS TO DATE. Quantity. Lode.	TOTALS TO DATE. Quantity. Stream.	TOTALS TO DATE. Quantity. Total.	TOTALS TO DATE. Value.
			tons.	tons.	tons.	£	tons.	tons.	tons.	£
PILBARA GOLDFIELD.										
MARBLE BAR DISTRICT.										
Cooglegong ...	...	Sundry claims	...	4·94	4·94	663	...	1,775·16	1,775·16	162,194
Mill's Find ...	...	Sundry claims	...	...	...	...	...	·85	·85	69
Moolyella ...	...	Voided leases	...	...	...	...	...	330·53	330·53	21,340
Do. ...	...	Sundry claims	...	12·92	12·92	1,868	...	2,939·89	2,939·89	284,893
Old Shaw ...	...	Voided leases	...	...	...	...	...	6·75	6·75	424
Do. ...	...	Sundry claims	...	...	...	...	...	214·85	214·85	14,636
Tabba Tabba ...	...	Sundry claims	—	...	...	...	...	117·80	117·80	13,278
Wodgina ...	M.Ls. 86, 87, 95	H.M. and Anchorite leases ...	...	...	...	...	...	5·00	5·00	500
Do. ...	...	Voided leases	...	...	...	...	366·84	21·55	388·39	35,511
Do. ...	...	Sundry claims	...	...	...	...	5·78	49·75	55·53	5,330
		Totals	...	**17·86**	**17·86**	**2,531**	**372·62**	**5,462·13**	**5,834·75**	**538,175**
MURCHISON GOLDFIELD.										
CUE DISTRICT.										
Poona	...	Sundry claims	...	...	...	...	...	1·52	1·52	118
Cuddingwarra ...	...	Sundry claims	...	...	...	...	...	3·20	3·20	242
		Totals	...	...	...	...	...	**4·72**	**4·72**	**360**
COOLGARDIE GOLDFIELD.										
COOLGARDIE DISTRICT.										
Bulla Bulling ...	...	Sundry claims	...	...	...	...	...	·15	·15	15
		Totals	...	...	...	...	...	**·15**	**·15**	**15**
GREENBUSHES MINERAL FIELD.										
Greenbushes ...	M.L. 620	Gold Coin	...	1·95	1·95	209	...	3·04	3·04	324
Do. ...	M.L. 515 ...	Kapanga	·43	...	·43	46	35·96	1·35	37·31	4,803
Do. ...	M.L. 628 ...	Lost and Found	...	...	...	...	·33	...	·33	50
Do. ...	M.L. 505, 614	Scotia leases	...	·51	·51	51	...	100·32	100·32	11,958
Do. ...	Locs. 289, 290	Clarth and others	...	...	...	...	...	318·04	318·04	28,959
Do. ...	Loc. 290 ...	McKay and Struthers ...	...	...	...	...	...	5·39	5·39	762
Do. ...	...	Voided leases	...	...	...	...	243·09	3,471·20	3,714·29	368,249
Do. ...	...	Sundry claims	·48	34·93	35·41	3,793	71·58	6,844·94	6,916·52	549,545
		Totals	**·91**	**37·39**	**38·30**	**4,099**	**350·96**	**10,744·28**	**11,095·24**	**964,650**

TABLE VIII.

QUANTITY AND VALUE OF TANTALITE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929. Quantity. Lode.	1929. Quantity. Stream.	1929. Quantity. Total.	1929. Value.	TOTAL TO DATE. Quantity. Lode.	TOTAL TO DATE. Quantity. Stream.	TOTAL TO DATE. Quantity. Total.	TOTAL TO DATE. Value.
			tons.	tons.	tons.	£	tons.	tons.	tons.	£
PILBARA GOLDFIELD.										
MARBLE BAR DISTRICT.										
Tabba Tabba ...	M.L. 317 ...	Koolinda, North	...	...	...	...	...	1·00	1·00	250
Do. ...	M.Ls. 321, 322	Strelly North leases'	...	...	...	...	...	·57	·57	165
Wodgina ...	M.Ls. 86, 87, 95	H.M. and Anchorite leases ...	...	11·27	11·27	3,598	2·25	102·24	104·49	19,411
Do. ...	M.L. 293 ...	May Be	...	...	...	...	...	2·00	2·00	240
Do. ...	...	Sundry claims	...	...	...	...	...	51·50	51·50	6,124
		Totals	...	**11·27**	**11·27**	**3,598**	**2·25**	**157·31**	**159·56**	**26,190**
GREENBUSHES MINERAL FIELD.										
Greenbushes ...	...	Voided leases	...	...	...	...	...	3·19	3·19	1,804
Do. ...	...	Sundry claims	...	·30	·30	70	...	·30	·30	70
		Totals	...	**·30**	**·30**	**70**	...	**3·49**	**3·49**	**1,874**

TABLE IX.

QUANTITY AND VALUE OF PYRITIC ORE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTAL TO DATE.	
			Quantity.	†Value.	Quantity.	†Value.
			tons.	£	tons.	£
MT. MARGARET GOLDFIELD.						
MT. MORGANS DISTRICT.						
Eulaminna ...	M.Ls. (4F), (5F), (11F), (12F)	West Australian Copper Co., Ltd.	...	...	61,687·98	38,818
Murrin Murrin...	M.L (18F) ...	Nangeroo: Nangaroo Mines, Ltd.	...	...	12,359·58	6,678
		Totals	...	...	**74,047·56**	**45,496**

† Represents the value of the sulphur only, the copper contents not having been treated.

TABLE X.

QUANTITY AND VALUE OF COPPER ORE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.			TOTAL TO DATE.		
			Quantity.		Value.	Quantity.		Value.
			Ore.	Metallic Copper.		Ore.	Metallic Copper.	
			tons.	tons.	£	tons.	tons.	£
WEST KIMBERLEY GOLDFIELD.								
Berylton ...	...	Voided leases	...	...	...	13·19	2·76	200
Yampi Sound ...	M.L. (1), [221H]	Yampi Sound Copper Mine	...	...	...	92·86	22·80	1,473
Do. ...	... ...	Sundry claims	...	...	...	3·47	·36	36
		Totals	...	...	...	**109·52**	**25·92**	**1,709**
PILBARA GOLDFIELD.								
MARBLE BAR DISTRICT.								
Marble Bar ...	... ...	Voided Leases	...	...	...	11·00	1·64	90
Do. ...	... ...	Sundry claims	...	...	...	4·75	·48	25
North Pole ...	... ...	Voided leases	...	...	...	9·35	1·39	81
North Shaw ...	... ...	Voided leases	...	...	...	7·77	1·90	190
		Totals	...	...	...	**32·87**	**5·41**	**386**
NULLAGINE DISTRICT.								
Lionel	... ...	Sundry claims	...	...	...	9·00	4·75	360
McPhee's Creek	M.L. (14L) ...	Tambina	...	...	...	5·00	2·22	120
		Totals	...	...	...	**14·00**	**6·97**	**480**
WEST PILBARA GOLDFIELD.								
Croydon ...	... ...	Voided leases	...	...	...	604·00	108·65	7,333
Egina	... ...	Voided leases	...	...	...	542·00	104·15	6,643
Roebourne ...	M.L. 183 ...	(Carlow Castle: Roebourne Copper Mine, Ltd.)	...	...	...	69·00	7·80	780
Do. ...	M.L. 174 ...	Good Fortune	...	...	...	56·77	8·58	904
Do. ...	M.Ls. 174, (175)	(Good Fortune leases)	...	...	...	63·40	9·58	1,011
Do. ...	M.L. 184 ...	Good Luck	...	...	...	5·21	1·01	111
Do. ...	M.L. 167 ...	(Quod Est.)	...	...	...	22·43	3·49	256
Do. ...	M.Ls. 167, 183	Roebourne Copper Mines, Ltd.	...	...	...	167·45	24·75	2,455
Do. ...	M.Ls. 144, (192), (193)	Yannery and Whundo Copper Mining Co., Ltd.	...	...	...	404·50	87·14	8,116
Do. ...	M.L. 144 ...	Yannery Hill Copper Mine	...	...	...	469·25	113·81	9,961
Do. ...	...	Voided leases	...	...	...	2,729·28	515·83	44,459
Do. ...	...	Sundry claims	...	...	...	77·41	13·61	800
Whim Creek ...	M.L. 34 ...	(Balla Balla Copper Mines, Ltd.)	...	...	...	2,009·00	166·33	12,036
Do. ...	M.L. 34 ...	Mons. Cupri: Whim Well Copper Mines, Ltd.	...	...	...	282·50	33·75	2,979
Do. ...	Loc. 71 ...	Pilbarra Copper Fields, Ltd.	...	...	...	2,650·50	574·31	46,096
Do. ...	Loc. 71 ...	(Whim Well Copper Mines, Ltd.)	...	...	...	72,562·75	9,343·89	604,492
Do. ...	...	Voided leases	...	...	...	30·00	5·50	250
		Totals	...	...	...	**82,745·45**	**11,122·18**	**748,482**

TABLE X.— *Quantity and Value of COPPER ORE, etc.*—continued.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.			TOTALS TO DATE.		
			Quantity.		Value.	Quantity.		Value.
			Ore.	Metallic Copper.		Ore.	Metallic Copper.	
			tons.	tons.	£	tons.	tons.	£
ASHBURTON GOLDFIELD.								
Ashburton ...	...	Sundry claims	...	...	...	6·32	·79	94
Red Hill ...	...	Voided leases	...	...	...	175·50	33·85	2,126
Uaroo	...	Voided leases	...	...	...	169·25	62·49	4,188
		Totals	...	...	...	**351·07**	**97·18**	**6,408**
PEAK HILL GOLDFIELD.								
Peak Hill ...	M.L. (35P) ...	Burra Copper Mines, Ltd.	...	...	...	25·84	8·85	943
Do. ...	M.Ls. (37P), (38P)	Sonia leases	...	...	...	135·04	47·26	4,807
Do. ...	M.L. (9P) ...	Sons of Gwalia	...	...	...	458·49	169·89	15,680
Do. ...	M.Ls. (29P), (30P) (31P)	(Two Sisters leases)	...	...	...	64·04	30·93	1,466
Do. ...	M.L. (31P) ...	Two Sisters North...	...	...	...	115·76	31·40	3,594
Do. ...	... ...	Voided leases	...	...	...	153·91	43·02	3,885
Do. ...	... ...	Sundry claims	...	...	...	62·03	21·96	1,837
		Totals	...	...	...	**1,015·11**	**353·31**	**32,212**
EAST MURCHISON GOLDFIELD.								
LAWLERS DISTRICT.								
Kathleen Valley	M.L. (12) ...	Shepherd	...	...	...	6·77	1·32	69
Lawlers ...	M.L. (29) ...	Bungarra	...	...	...	157·44	23·85	2,837
Do. ...	...	Sundry claims	...	...	...	74·35	13·25	1,458
		Totals	...	...	...	**238·56**	**38·42**	**4,364**
MURCHISON GOLDFIELD.								
MEEKATHARRA DISTRICT.								
Gabanintha ...	...	Voided leases	...	...	...	920·56	119·84	9,381
Do. ...	...	Sundry claims	...	...	...	34·42	9·23	1,072
Holden's Find...	...	Sundry claims	...	...	...	6·72	1·11	111
Yaloginda ...	...	Sundry claims	...	...	...	6·76	1·41	150
		Totals	...	...	...	**968·46**	**131·59**	**10,714**
DAY DAWN DISTRICT.								
Day Dawn ...	... ...	Voided leases	...	...	...	26·95	5·17	305
Do. ...	... ...	Sundry claims	...	...	...	28·61	2·93	217
		Totals	...	...	...	55·56	8·10	522
YALGOO GOLDFIELD.								
Mount Gibson ...	... ...	Sundry claims	...	...	...	4·99	1·10	95
Twin Peaks ...	... ...	Sundry claims	...	...	...	19·50	3·49	227
Wadgingarra ...	M.L. (6) ...	Olive Queen	...	...	...	13·91	·98	91
		Totals	...	...	...	**38·40**	**5·57**	**413**
NORTHAMPTON MINERAL FIELD.								
Narra Tarra ...	Loc. 833 ...	Narra Tarra	116·00	12·11	974	116·00	12·11	974
Do. ...	Loc. 833 ...	(Narra Tarra: Fremantle Trading Co., Ltd.)	...	...	...	23,766·67	1,784·64	116,485
Geraldine ...	...	Voided leases	...	...	...	136·50	36·05	1,992
		Totals	**116·00**	**12·11**	**974**	**24,019·17**	**1,832·80**	**119,451**
YANDANOOKA MINERAL FIELD.								
Arrino	... ...	Sundry claims	...	...	...	126·05	18·48	1,386
Yandanooka ...	Freehold Gd. ...	Muggawa Copper Mines	...	...	...	7·50	1·20	96
Do. ...	... ...	Voided leases	...	...	...	38·00	7·95	407
		Totals	...	...	...	**171·55**	**27·63**	**1,889**
MOUNT MARGARET GOLDFIELD.								
MOUNT MORGANS DISTRICT.								
Eualminna ...	[10C, 11C], (4F), (5F) (12C, 37C)	(Mt. Malcolm Copper Mine leases) ...	...	...	...	13,516·00	1,001·98	70,754
Do. ...	[10C, 11C], (4F), (5F)	(Mt. Malcolm Copper Mine leases) ...	...	...	...	3,839·00	418·00	17,065
Do. ...	[10C, 11C], (4F), (5F), (12C, 37C)	(Murrin Copper Mines, Ltd.)	...	...	...	19,165·00	798·50	45,817
Do. ...	(4F), (5F), (11F), (12F)	West Australian Copper Co., Ltd.	...	...	...	9,794·05	1,976·08	80,199
Mt. Margaret ...	G.M.L. (66F) ...	Mt. Morven	...	...	...	11·53	2·40	163
Murrin Murrin...	(18F)	Nangeroo: Nangaroo Mines, Ltd.	...	...	...	6·80	3·00	160
Do. ...	... ...	Voided leases	...	...	...	1,525·29	248·04	16,662
		Totals	...	...	...	**47,857·67**	**4,448·00**	**230,820**

TABLE X.—*Quantity and Value of COPPER ORE, etc.*—continued.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929. Quantity. Ore.	1929. Quantity. Metallic Copper.	1929. Value.	TOTALS TO DATE. Quantity. Ore.	TOTALS TO DATE. Quantity. Metallic Copper.	TOTALS TO DATE. Value.
			tons.	tons.	£	tons.	tons.	£
MOUNT MARGARET GOLDFIELD—*continued*.								
MOUNT MARGARET DISTRICT.								
Burtville ...	M.L. (16T) ...	Dreadnought	...	...	...	2·85	·29	26
		Totals	...	...	...	2·85	·29	26
NORTH COOLGARDIE GOLDFIELD.								
MENZIES DISTRICT.								
Goongarrie ...	M.L. (13Z) ...	Providence Copper Mining Syndicate, Ltd.	...	...	...	4·70	·42	33
Do. ...	... ...	Sundry claims	...	...	...	1·42	·40	18
		Totals	...	...	...	6·12	·82	51
EAST COOLGARDIE GOLDFIELD.								
EAST COOLGARDIE DISTRICT.								
Boorara ...	M.L. (100E) ...	Premier Copper Mine	...	...	...	50·67	6·22	330
		Totals	...	...	...	50·67	6·22	330
PHILLIPS RIVER GOLDFIELD.								
Kundip ...	G.M.Ls. 147, 179	Fair Play leases	...	...	...	130·09	131·30	11,975
Do. ...	G.M.L. 184 ...	Gem	...	...	...	90·98	22·58	2,404
Do. ...	G.M.Ls. 151, 156	Gem Consolidated leases	...	...	...	48·00	76·75	8,327
Do. ...	M.Ls. 52, 94 ...	Harbour View Gold and Copper Co., Ltd. ...	...	...	...	1,209·93	90·14	8,236
Do. ...	M.Ls. 52, 94 ...	(Harbour View leases)	...	...	...	604·36	76·80	4,524
Do. ...	M.Ls. 52, 94 ...	(Harbour View leases)	...	...	...	508·27	64·66	3,642
Do. ...	G.M.L. (98) ...	Hillsborough	...	...	...	692·84	57·65	4,746
Do. ...	M.L. 370 ...	North Harbour View	...	...	...	15·72	·99	124
Do. ...	M.Ls. 52, 94 ...	(Ravensthorpe G.M. Syndicate, N.L.) ...	...	...	...	132·56	24·36	1,382
Do. ...	... ...	Voided leases	...	...	...	3,430·67	319·32	22,398
Do. ...	... ...	Sundry claims	...	...	...	111·12	17·40	1,372
Mt. Desmond ...	... ...	Voided leases	...	...	...	46,952·31	4,107·47	279,054
Do. ...	... ...	Sundry claims	33·18	5·75	420	173·43	30·92	2,321
Ravensthorpe ...	M.L. (16) ...	Marion Martin	...	...	...	2,270·63	256·94	26,496
Do. ...	M.L. (16) ...	(Marion Martin)	...	...	...	865·69	130·61	6,650
Do. ...	M.L. (16) ...	(Marion Martin: Phillips River Gold and Copper Co., Ltd.)	...	...	...	2,855·36	375·44	23,506
Do. ...	M.L. (15) ...	Mount Cattlin	...	...	...	2,178·01	142·64	15,296
Do. ...	M.L. (15) ...	(Mount Cattlin)	...	...	...	281·56	31·35	1,716
Do. ...	M.L. (15) ...	(Mount Cattlin: Mount Cattlin Copper Mining Co., Ltd.)	...	...	...	6,608·76	333·59	28,841
Do. ...	M.L. (15) ...	(Mount Cattlin: Phillips River Gold & Copper Co., Ltd.)	...	...	...	1,263·76	80·26	7,646
Do. ...	M.L. (15) ...	(Mount Cattlin: Phillips River Gold and Copper Co., Ltd.)	...	...	...	14,432·25	714·90	40,313
Do. ...	... ...	Voided leases	...	...	...	7,880·86	986·55	63,429
Do. ...	... ...	Sundry claims	...	...	...	1,157·36	133·24	11,482
West River ...	... ...	Voided leases	...	...	...	44·04	7·41	414
Do. ...	... ...	Sundry claims	...	...	...	150·69	25·84	2,061
		From Goldfield generally	...	...	...	1,637·88	128·64	9,760
		Totals	33·18	5·75	420	95,727·13	8,367·75	588,115
STATE GENERALLY.								
...	... ...	Voided leases	...	...	...	5·11	1·54	56
...	... ...	Sundry claims	...	...	...	13·50	2·27	193
		Totals	...	...	...	18·61	3·81	249

TABLE XI.

QUANTITY AND VALUE OF IRONSTONE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			tons.	£	tons.	£
WEST PILBARA GOLDFIELD.						
Whim Creek ...	(17), (18), (21)	Whim Well Copper Mines	...	...	100·00	300
		Totals	...	...	**100·00**	**300**
EAST COOLGARDIE GOLDFIELD.						
EAST COOLGARDIE DISTRICT.						
Boulder ...	(1490E) ...	Mt. Ferrum	...	...	450·00	247
		Totals	...	...	**450·00**	**247**
STATE GENERALLY.						
		Avon	...	...	22,223·00	16,241
		Clackline	...	...	18,253·50	8,789
		Coates' Paddock	...	...	4,712·00	3,277
		Greenbushes	...	...	7,481·00	4,629
		Koolan Island—Yampi Sound	...	...	10·50	12
		Werribee	...	...	4,600·00	3,200
		Totals	...	...	**57,280·00**	**36,148**

TABLE XII.

QUANTITY AND VALUE OF LEAD ORE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.			TOTALS TO DATE.		
			Lead Ore.	Metal therefrom.	Value.	Lead Ore.	Metal therefrom.	Value.
			tons.	tons.	£	tons.	tons.	£
NORTHAMPTON MINERAL FIELD.								
Geraldine ...	Loc. 1 ...	Geraldine Mine	...	...	...	774·59	257·13	5,139
Do. ...	M.L. 203 ...	Geraldine South	155·00	50·00	450	155·00	50·00	450
Do. ...	M.L. 200 ...	Grand Junction	40·00	14·00	92	267·50	53·19	887
Do. ...	M.L. 24 P.P. ...	(Spring Vale)	...	...	...	2,290·00	261·33	8,893
Do. ...	M.L. 24 P.P. ...	Springvale: Tarcoola Blocks Mines, N.L.	...	...	...	3,350·00	357·46	9 640
Do. ...	M.Ls. (148), (150), (154), (158), 20 P.P.	Surprise leases	...	...	...	93,834·03	13,019·33	392,709
Do. ...	M.L. (158) ...	(Surprise South)	...	...	...	14·00	5·41	170
Do. ...	M.L. (153) ...	Three Sisters: Ajana Lead Mines, Ltd.	...	...	...	8,726·00	892·88	30,619
Do. ...	M.L. (153) ...	(Three Sisters)...	...	...	...	6·25	3·94	112
Do. ...	M.L. (197) ...	(Two Boys)	...	...	...	4,874·50	547·99	16,403
Do. ...	M.L. (197) ...	Two Boys: Two Boys Lead Mining Co., Ltd.	...	...	...	4,870·75	394·17	12,089
Do. ...	M.L. 202 ...	Welcome: Two Boys Lead Mining Co., Ltd.	...	...	...	1,263·00	115·21	3,274
Do. ...	M.L. 23 P.P. ...	Wheal Ina	...	...	...	513·00	85·27	1,877
Do. ...	Loc. 7 ...	Thring & Green	370·00	125·00	1,835	3,538·38	1,104·25	25,728
Do. ...	...	Voided leases	...	...	...	145·49	87·61	1,357
Do. ...	...	Sundry claims	330·00	124·00	942	657·04	299·65	4,350
Narra Tarra ...	Loc. 833 ...	Jupp & others (Tributers) ...	...	...	...	846·00	129·60	2,293
Do. ...	Loc. 833 ...	Narra Tarra: Fremantle Trading Co., Ltd.	...	...	...	126,429·50	12,377·27	361,745
Do. ...	Locs. 118/9 ...	Lander & Raven (Tributers)	...	...	...	106·21	60·02	1,345
Do. ...	...	Sundry claims	...	...	...	238·16	34·18	442
Northampton ...	Loc. 1472 ...	Baddera: Fremantle Trading Co., Ltd.	...	...	...	129,264·56	13,888·33	317,631
Do. ...	Loc. 436 ...	Fortune Exploration Co., N.L. ...	...	...	...	123·38	51·17	1,316
Do. ...	M.L. 27 P.P. ...	Lady Samson	...	...	...	45·00	7·25	132
Do. ...	Loc. 1146 ...	Wheal Ellen: Fremantle Trading Co., Ltd.	...	...	...	22,033·28	1,818·71	52,456
Do. ...	Loc. 436 ...	Wheal of Fortune Extended Syndicate	...	...	...	125·82	43·13	793
Do. ...	...	Voided leases	...	...	...	3,266·76	723·13	14,329
Do. ...	...	Sundry claims	180·00	32·00	448	437·12	171·14	3,167
Victoria ...	...	Voided leases	...	...	...	19·00	12·54	212
		Totals... ...	**1,075·00**	**345·00**	**3,767**	**408,214·32**	**46,851·29**	**1,269,558**
WEST PILBARA GOLDFIELD.								
Roebourne ...	... ...	Sundry claims	...	...	...	2·57	1·36	39
Whim Creek ...	M.L. (172) ...	Cumstock	...	...	...	104·00	46·00	1,490
		Totals	..	...	...	**106·57**	**47·36**	**1,529**

TABLE XIII.

QUANTITY AND VALUE OF SILVER-LEAD ORE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			tons.	£	tons.	£
		PILBARA GOLDFIELD.				
		MARBLE BAR DISTRICT.				
Braeside ...	M.L. 295 ...	Koongalin	...	...	46·00	1,140
Do. ...	M.L. 297 ...	Oakover	...	...	20·85	347
Do. ...	M.L. (288) ...	Ragged Hill	...	...	28·50	627
Do. ...	...	Sundry claims	...	...	98·50	1,509
Do. ...	...	Voided leases	...	...	1·50	35
		Totals	...	...	**195·35**	**3,658**
		ASHBURTON GOLDFIELD.				
Uaroo ...	M.L. 102 ...	Silver Star	...	...	90·00	1,809
Do. ...	...	Voided leases	...	...	2,880·95	33,947
Do. ...	...	Sundry claims	...	...	2·83	40
		Totals	...	...	**2,973·78**	**35,796**

TABLE XIV.

QUANTITY AND VALUE OF COAL REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			tons.	£	tons.	£
		COLLIE MINERAL FIELD.				
Collie ...	197, etc. ...	Amalgamated Collieries of W.A., Ltd. (Cardiff Mine)	85,113·30	65,929	681,557·58	551,208
Do. ...	244, etc. ...	Amalgamated Collieries of W.A., Ltd. (Co-operative Mine) ...	129,157·50	101,939	1,157,195·01	957,714
Do. ...	85, etc. ...	Amalgamated Collieries of W.A., Ltd. (Proprietary Mine) ...	156,219·90	123,207	1,268,002·26	1,054,671
Do. ...	74, etc. ...	Amalgamated Collieries of W.A., Ltd. (Stockton Mine)	41,489·10	30,463	65,603·40	47,532
Do. ...	250, etc. ...	Amalgamated Collieries of W.A., Ltd. (Westralia Mine) ...	117,500·80	92,382	789,366·72	668,263
Do. ...	151, etc. ...	(Amalgamated Collieries of W.A., Ltd.) (Scottish Mine)	...	...	380·00	251
Do. ...	197, etc. ...	(Cardiff Coal Mining Co., Ltd.)	...	...	976,824·78	471,417
Do. ...	151, etc. ...	(Collie Boulder Coal Co., Ltd.)	...	...	71,512·70	26,139
Do. ...	244, etc. ...	(Collie Co-operative Collieries, Ltd.)	...	...	970,044·30	511,862
Do. ...	88 (part of) ...	(Collie Proprietary Coalfields of W.A., Ltd.)	...	...	477,781·55	242,918
Do. ...	85, etc. ...	(Collie Proprietary Coalfields of W.A., Ltd.)	...	...	580,392·15	289,246
Do. ...	314, etc. ...	(Griffin leases)	...	...	1,866·27	1,228
Do. ...	314, etc. ...	Griffin Coal Mining Co., Ltd.)	15,238·00	12,786	15,525·18	12,958
Do. ...	260, etc. ...	(Premier Coal Mining Co., Ltd.)	...	...	468,086·03	347,155
Do. ...	151, etc. ...	(Scottish Collieries, Ltd.)	...	...	2,314·51	1,210
Do. ...	151, etc. ...	(Scottish Co-operative Collieries Co., Ltd.)	...	...	430,796·95	171,303
Do. ...	85, etc. ...	(The Proprietary Coal Mines of W.A., Ltd.)	...	...	693,045·34	413,755
Do. ...	88 (part of) ...	(The Proprietary Coal Mines of W.A., Ltd.)	...	...	109·00	54
Do. ...	250, etc. ...	(Westralian Coal Mining Co., Ltd.)	...	...	507,384·00	307,913
Do. ...	250, etc. ...	(Westralian Black Diamond Collieries, Ltd.)	...	...	125,083·24	117,827
Do. ...	...	Voided leases	...	...	25,569·85	12,930
		Totals	**544,718·60**	**426,706**	**9,308,440·93**	**6,207,554**

TABLE XV.

QUANTITY AND VALUE OF FIRECLAY REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
		COLLIE MINERAL FIELD.	tons.	£	tons.	£
Collie	87	Amalgamated Collieries of W.A., Ltd. (Proprietary lease) ...	...	...	1,050·80	738
		Totals	...	...	**1,050·80**	**738**

TABLE XVI.

QUANTITY AND VALUE OF LIMESTONE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value
			tons.	£	tons.	£
MURCHISON GOLDFIELD.						
CUE DISTRICT.						
Cuddingwarra ...	M.L. (3) ...	Linella	...	...	298·00	772
		Totals	...	...	**298·00**	**772**
YILGARN GOLDFIELD.						
Southern Cross	... ...	Voided leases	...	...	2,548·85	1,607
		Totals	...	...	**2,548·85**	**1,607**
STATE GENERALLY.						
Fremantle ...	... ...	... ...	...	...	90,858·88	15,911
		Totals	...	...	**90,858·88**	**15,911**

TABLE XVII.

QUANTITY AND VALUE OF ASBESTOS REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			tons.	£	tons.	£
PILBARA GOLDFIELD.						
MARBLE BAR DISTRICT.						
Coogiegong ...	...	Voided leases	...	...	70·10	3,660
Soansville ...	M.L. 323 ...	Chrysotile: Soansville Asbestos Syndicate, Ltd.	63·70	6,113	63·70	6,113
Do. ...	M.L. 324 ...	Chrysotile West	...	...	5·70	600
Do. ...	...	Voided leases	...	...	42·83	1,754
		Totals	**63·70**	**6,113**	**182·33**	**12,127**
NULLAGINE DISTRICT.						
Lionel	...	Voided leases	...	...	578·98	27,197
Do. ...	...	Sundry claims	...	...	323·28	9,815
		Totals	...	...	**902·26**	**37,012**
WEST PILBARA GOLDFIELD						
Roebourne ...	...	Sundry claims	...	...	·85	17
Sherlock ...	...	Greenhill: Australian and General Asbestos Co., Ltd. ...	191·25	8,568	191·25	8,568
Do. ...	...	Voided leases	...	...	14·63	314
		Totals	**191·25**	**8,568**	**206·73**	**8,899**

TABLE XVIII.

QUANTITY AND VALUE OF GADOLINITE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			tons.	£	tons.	£
PILBARA GOLDFIELD.						
MARBLE BAR DISTRICT.						
Coogiegong ...	(M.L. 254) ...	Iverna	...	...	1·00	112
		Totals	...	...	**1·00**	**112**

TABLE XIX.

QUANTITY AND VALUE OF TUNGSTEN ORES REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

SCHEELITE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.			TOTALS TO DATE.		
			Ore.	Contents Tungstic Trioxide.	Value.	Ore.	Contents Tungstic Trioxide.	Value.
			tons.	units.	£	tons.	units.	£
NORTH COOLGARDIE GOLDFIELD.								
MENZIES DISTRICT.								
Comet Vale ...	G.M.L. 5410z...	Lake View	...	...	...	380·84	338·39	818
Do. ...	... ...	Sundry claims	...	...	...	26·47	47·38	124
		Totals	...	...	...	**407·31**	**385·77**	**942**
BROAD ARROW GOLDFIELD.								
Ora Banda ...	... ...	Sundry claims	...	...	...	3·35	66·50	175
		Totals	...	...	...	**3·35**	**66·50**	**175**
COOLGARDIE GOLDFIELD.								
COOLGARDIE DISTRICT.								
Higginsville ...	... ...	Sundry claims	...	...	...	85·71	59·07	155
		Totals	...	...	...	**85·71**	**59·07**	**155**
DUNDAS GOLDFIELD.								
Norseman ...	... ...	Sundry claims	...	...	...	·41	3·98	10
		Totals	...	...	...	**·41**	**3·98**	**10**

WOLFRAM.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.			TOTALS TO DATE.		
			Ore.	Metallic contents.	Value.	Ore.	Metallic contents.	Value.
			tons.	tons.	£	tons.	tons.	£
MURCHISON GOLDFIELD.								
CUE DISTRICT.								
Callie Spring ...	M.L. (11) ...	Socialist	...	...	...	194·00	6·11	877
Do. ...	... ...	Sundry claims	...	...	...	44·64	2·30	271
		Totals	...	...	...	**238·64**	**8·41**	**1,148**
YALGOO GOLDFIELD.								
Yalgoo	M.L. (36) ...	Yandanoo King North	...	...	...	·25	·12	27
		Totals	...	...	...	**·25**	**·12**	**27**
STATE GENERALLY.								
Derby	(146H) ...	Taylor's Wolfram Reward ...	...	...	...	27·00	2·00	120
		Totals	...	...	...	**27·00**	**2·00**	**120**

TABLE XX.

QUANTITY AND VALUE OF MAGNESITE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			tons.	£	tons.	£
EAST COOLGARDIE GOLDFIELD.						
BULONG DISTRICT.						
Bulong	... ...	Sundry claims	...	...	824·75	1,053
		Totals	...	...	824·75	1,053

TABLE XXI.

QUANTITY AND VALUE OF ANTIMONY REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.			TOTALS TO DATE.		
			Ore.	Metallic contents.	Value.	Ore.	Metallic contents.	Value.
			tons.	tons.	£	tons.	tons.	£
WEST PILBARA GOLDFIELD.								
Balla Balla ...	M.L. (185) ...	Star	...	...	...	20·78	11·58	491
		Totals	...	...	...	20·78	11·58	491

TABLE XXII.

QUANTITY AND VALUE OF GYPSUM REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			tons	£	tons.	£
YILGARN GOLDFIELD.						
Lake Seabrook	... ...	Sundry claims	761·00	761	2,812·25	2,812
		Totals	**761·00**	**761**	**2,812·25**	**2,812**
STATE GENERALLY.						
Baandee ...	...	Sundry claims	1,073·00	1,611	5,260·71	7,628
Dukin ...	...	Sundry claims	...	...	487·00	561
Hines Hill ...	...	Sundry claims	...	...	2,699·00	2,381
Koorda ...	M.L. 280H ...	White Cross	831·00	1,247	6,558·55	9,202
Woolundra ...	...	Sundry claims	2,624·00	4,057	10,302·20	15,987
		Totals	**4,528·00**	**6,915**	**25,307·46**	**35,759**

TABLE XXIII.

QUANTITY AND VALUE OF EMERALDS REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.			TOTALS TO DATE.		
			Quantity.		Value.	Quantity.		Value.
			carats (rough).	carats (cut).	£	carats (rough).	carats (cut).	£
		MURCHISON GOLDFIELD.						
		CUE DISTRICT.						
Poona	M.L. 79 ...	Star One: Star Mining Syndicate, Ltd.	557	52	278	18,121	252	1,609
		Totals	557	52	278	18,121	252	1,609

TABLE XXIV.

QUANTITY AND VALUE OF DIAMONDS REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			carats.	£	carats.	£
		PILBARA GOLDFIELD.				
		NULLAGINE DISTRICT.				
Nullagine ...	M.R.C. (6L) ...	Morgans, A. E.	...	...	...	24
		Totals	...	...	...	24

TABLE XXV.

QUANTITY AND VALUE OF MANGANESE REPORTED TO THE MINES DEPARTMENT DURING 1929, AND TOTALS TO DATE.

LOCALITY.	NUMBER OF LEASE, CLAIM, OR AREA.	REGISTERED NAME OF COMPANY OR LEASE.	1929.		TOTALS TO DATE.	
			Quantity.	Value.	Quantity.	Value.
			tons.	£	tons.	£
		PEAK HILL GOLDFIELD.				
Horseshoe ..	...	Voided leases	...	...	18·11	142
Do. ...	...	Sundry claims	...	...	58·63	294
		Totals	...	...	76·74	436

TABLE

RETURN OF ORE AND MINERALS OTHER THAN GOLD

YEAR.	COPPER.												
	COPPER ORE.										COPPER INGOT, MATTE, ETC.		Total Value of Copper Exported.
	West Pilbara Gf.		Northampton Mf.		Phillips River Gf.		State generally.		Total.		State generally.		
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	£
1850 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
1 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
2 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
3 ...	...	...	[2]†	7	...	...	...	...	...	7	...	...	7
4 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
5 ...	...	...	2	26	...	...	...	...	2	26	...	...	26
6 ...	...	...	57	1,018	...	...	...	...	57	1,018	...	...	1,018
7 ...	...	...	80	1,920	...	...	...	...	80	1,920	...	...	1,920
8 ...	...	...	433	9,531	...	...	...	...	433	9,531	...	...	9,531
9 ...	...	...	941	14,122	...	...	...	...	941	14,122	...	...	14,122
1860 ...	...	...	517	8,021	...	...	...	...	517	8,021	...	...	8,021
1 ...	...	...	409	6,339	...	...	...	...	409	6,339	...	...	6,339
2 ...	...	...	783	12,536	...	...	...	...	783	12,536	...	...	12,536
3 ...	...	...	763	12,208	...	...	...	...	763	12,208	...	...	12,208
4 ...	...	...	1,076	17,216	...	...	...	...	1,076	17,216	...	...	17,216
5 ...	...	...	886	13,290	...	...	...	...	886	13,290	...	...	13,290
6 ...	...	...	557	8,362	...	...	...	...	557	8,362	...	...	8,362
7 ...	...	...	337	5,055	...	...	...	...	337	5,055	...	...	5,055
8 ...	...	...	83	1,245	...	...	...	...	83	1,245	...	...	1,245
9 ...	...	...	155	2,325	...	...	...	...	155	2,325	...	...	2,325
1870 ...	...	...	6	90	...	...	...	...	6	90	...	...	90
1 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
2 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
3 ...	...	...	56	848	...	...	...	...	56	848	...	...	848
4 ...	...	...	67	998	...	...	...	...	67	998	...	...	998
5 ...	...	...	205	3,071	...	...	...	...	205	3,071	...	...	3,071
6 ...	...	...	279	4,185	...	...	...	...	279	4,185	...	...	4,185
7 ...	...	...	54	803	...	...	...	...	54	803	...	...	803
8 ...	...	...	9	135	...	...	...	...	9	135	...	...	135
9 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
1880 ...	...	...	8	120	...	...	...	...	8	120	...	...	120
1 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
2 ...	...	...	2	23	...	...	...	...	2	23	...	...	23
3 ...	...	...	5	75	...	...	...	...	5	75	...	...	75
4 ...	...	...	118	1,770	...	...	...	...	118	1,770	...	...	1,770
5 ...	...	...	120	1,793	...	...	...	...	120	1,793	...	...	1,793
6 ...	...	...	249	3,735	...	...	...	...	249	3,735	...	...	3,735
7 ...	...	...	23	345	...	...	...	...	23	345	...	...	345
8 ...	...	...	88	1,488	...	...	...	...	88	1,488	...	...	1,488
9 ...	...	...	112	1,904	...	...	...	...	112	1,904	...	...	1,904
1890 ...	...	...	8	136	...	...	...	...	8	136	...	...	136
1 ...	263	4,462	...	...	...	...	...	...	263	4,462	...	...	4,462
2 ...	[1]†412	6,319	155	2,377	...	...	...	...	567	8,696	...	...	8,696
3 ...	50	606	...	...	...	...	...	...	50	606	...	...	606
4 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
5 ...	802	12,832	24	120	...	...	...	...	826	12,952	...	...	12,952
6 ...	6	100	...	...	...	...	...	...	6	100	...	...	100
7 ...	65	731	21	302	...	...	...	...	86	1,033	...	...	1,033
8 ...	281	3,334	75	932	...	...	...	...	356	4,266	...	...	4,266
9 ...	1,404	31,979	587	9,473	...	...	...	...	1,991	41,452	...	...	41,452
1900 ...	544	10,696	...	...	105	2,411	197	3,355	846	16,462	249	17,475	33,937
1 ...	1,058	26,464	1	10	1,205	22,107	397	6,322	2,661	54,903	880	55,866	110,769
2 ...	68	1,698	20	330	162	2,469	33	489	283	4,986	175	7,918	12,904
3 ...	4	180	25	460	302	3,538	15	349	346	4,527	1,075	33,288	37,815
4 ...	50	500	...	...	11	154	310	3,378	371	4,032	102	3,827	7,859
5 ...	...	...	...	...	80	2,808	713	8,576	793	11,384	794	53,867	65,251
6 ...	112	323	...	...	...	...	224	2,930	336	6,162	343	30,367	36,529
7 ...	...	...	...	...	...	...	3,727	61,493	3,727	61,493	1,602	141,883	203,376
8 ...	...	...	...	...	...	...	2,503	29,272	2,503	29,272	479	27,819	57,091
9 ...	...	...	...	...	...	...	6,959	59,541	6,959	59,541	833	45,100	104,641
1910 ...	...	...	...	...	...	...	6,309	27,271	6,309	27,271	1,281	68,657	95,928
1 ...	...	...	...	...	...	...	9,825	33,709	9,825	33,709	828	44,409	78,118
2 ...	...	...	...	...	...	...	9,536	58,688	9,536	58,688	28	1,136	59,824
3 ...	...	...	...	...	...	...	4,339	136,472	4,339	136,472	82	5,891	142,363
4 ...	...	...	...	...	...	...	3,913	33,654	3,913	33,654	183	4,520	38,174
5 ...	...	...	...	...	...	...	737	13,768	737	13,768	946	77,401	91,169
6 ...	...	...	...	...	...	...	650	14,971	650	14,971	457	49,862	64,833
7 ...	...	...	...	...	...	...	966	20,878	966	20,878	535	64,860	85,738
8 ...	...	...	...	...	...	...	1,643	24,877	1,643	24,877	478	41,269	66,146
9 ...	...	...	...	...	...	...	455	9,740	455	9,740	4	365	10,105
1920 ...	...	...	...	...	...	...	1,511	22,467	1,511	22,467	137	2,698	25,165
1921 ...	...	...	...	...	...	...	1,040	16,153	1,040	16,153	206	8,448	24,601
1922 ...	...	...	...	...	...	...	352	5,519	352	5,519	660	14,860	20,379
1923 ...	...	...	...	...	...	...	3,394	48,907	3,394	48,907	1,057	16,193	65,100
1924 ...	...	...	...	...	...	...	2,795	40,676	2,795	40,676	...	...	40,676
1925 ...	...	...	...	...	...	...	1,201	18,200	1,201	18,200	...	...	18,200
1926 ...	...	...	...	...	...	...	...	...	...	...	1	84	84
1927 ...	...	...	...	...	...	...	...	...	...	...	2	101	101
1928 ...	...	...	...	...	...	...	100	765	100	765	...	...	765
1929 ...	...	...	...	...	...	...	129	2,778	129	2,778	...	...	...
Total ...	...	...	...	...	...	...	...	...	80,353	990,562	13,417	818,164	1,808,726

[1]† See Woodward's Mining Handbook, Perth: By Authority, 1895; page 123.

[2]† Weight not stated.

XXVI.

ENTERED FOR EXPORT FROM 1850 TO 1929, INCLUSIVE.

TIN.											
BLACK TIN (Dressed Tin ore).								TIN INGOT.		Total Value of Tin Exported.	YEAR.
Pilbara Gf.		Greenbushes Mf.		[3]†State generally.		Total.		Greenbushes Mf.			
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
tons	£	tons.	£	tons.	£	tons.	£	tons.	£	£	
...	...	...	...	...	...	...	...	...	...	...	1850
...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	..	4
...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	1860
...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	1870
...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	1880
...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	9
...	...	5	300	...	...	5	300	...	...	300	9
...	...	68	5,400	...	...	68	5,400	...	...	5,400	1890
...	...	204	10,200	...	...	204	10,200	...	...	10,200	1
...	...	265	13,843	...	...	265	13,843	...	...	13,843	2
57	3,470	171	7,664	...	...	228	11,134	...	...	11,134	3
19	949	371	14,325	...	...	390	15,274	...	...	15,274	4
...	...	277	9,703	...	...	277	9,703	...	...	9,703	5
...	...	137	4,338	...	...	137	4,338	...	...	4,338	6
...	...	96	3,275	...	...	96	3,275	...	...	3,275	7
...	...	68	2,760	...	...	68	2,760	...	...	2,760	8
30	2,025	278	21,138	...	...	308	23,163	...	...	23,163	9
368	30,146	102	8,032	...	...	470	38,178	142	18,872	57,050	1900
439	34,600	68	4,895	...	...	507	39,495	97	12,607	52,102	1
248	19,698	31	2,870	...	...	279	22,568	141	16,830	39,398	2
267	20,988	25	1,868	...	...	292	22,856	235	29,277	52,133	3
64	4,932	24	1,389	379	20,797	467	27,118	129	16,155	43,273	4
188	16,853	119	8,177	666	51,748	973	76,778	2T	1	76,779	5
329	28,375	444	46,254	624	64,005	1,397	138,634	45	8,746	147,380	6
...	...	...	...	1,424	151,414	1,424	151,414	78	14,725	166,139	7
...	...	...	...	1,093	83,594	1,093	83,594	2T	1	83,595	8
...	...	...	...	698	62,989	698	62,989	...	...	62,989	9
...	...	...	...	500	45,129	500	45,129	...	...	45,129	1910
...	...	...	...	495	55,220	495	55,220	...	...	55,220	1
...	...	...	...	651	79,738	651	79,738	...	...	79,738	2
...	...	...	...	484	72,142	484	72,142	...	...	72,142	3
...	...	...	...	363	35,649	363	35,649	...	...	35,649	4
...	...	...	...	429	41,391	429	41,391	...	...	41,391	5
...	...	...	...	463	49,101	463	49,101	...	...	49,101	6
...	...	...	...	383	45,288	383	45,288	...	...	45,288	7
...	...	...	...	415	76,952	415	76,952	...	...	76,952	8
...	...	...	...	318	47,269	318	47,269	...	...	47,269	9
...	...	...	...	243	49,449	243	49,449	...	...	49,449	1920
...	...	...	...	67	6,485	67	6,485	...	...	6,485	1921
...	...	...	...	110	10,930	110	10,930	...	...	10,930	1922
...	...	...	...	131	15,095	131	15,095	...	...	15,095	1923
...	...	...	...	87	12,008	87	12,008	...	...	12,008	1924
...	...	...	...	108	15,392	108	15,392	...	...	15,392	1925
...	...	...	...	67	10,450	67	10,450	...	...	10,450	1926
...	...	...	...	77	13,316	77	13,316	...	...	13,316	1927
...	...	...	...	85	15,002	85	15,002	...	...	15,002	1928
...	...	...	...	77	13,432	77	13,432	...	...	13,432	1929
...	...	...	...	...	...	15,199	1,472,452	867	117,214	1,589,666	Total

[3]†Weight not stated.

[3]†Probably the produce of Pilbara Goldfield and Greenbushes Mineral Field.

TABLE XXVI.—*Return of Ore and Minerals other than Go*

YEAR.	SILVER.		‡ LEAD.		‡ LEAD AND SILVER-LEAD.		PIG LEAD.		ZINC INGOTS AND CONCENTRATES.	
	State generally.		Northampton Mf.		State generally.		State generally.		State generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	ozs	£	tons.	£	tons.	£	tons.	£	tons	£
1850	...	...	5	55	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	[2]†	4	...	...	55	1,200	...	...
4	...	...	...	...	...	...	122	2,440	...	...
5	...	...	25	250	...	...	134	2,675	...	...
6	...	...	...	...	...	...	60	1,200	...	...
7	...	...	...	...	...	...	120	2,410	...	...
8	...	...	...	...	...	...	61	1,220	...	...
9	...	...	13	135	...	...	25	495	...	...
1860	...	...	98	985	...	...	...	...	...	...
1	...	...	79	790	...	...	...	...	...	...
2	...	...	9	90	...	...	...	...	...	...
3	...	...	230	2,300	...	...	...	...	...	...
4	...	...	80	800	...	...	...	...	...	...
5	...	...	703	8,436	...	...	...	...	...	...
6	...	...	273	3,282	...	...	...	...	...	...
7	...	...	902	10,824	...	...	[4]†3	50	...	...
8	...	...	1,100	13,206	...	...	...	...	...	...
9	...	...	699	8,394	...	...	...	...	...	...
1870	...	...	1,209	14,514	...	...	...	...	...	...
1	...	...	420	5,040	...	...	...	...	...	...
2	...	...	364	4,368	...	...	...	...	...	...
3	...	...	965	11,586	...	...	...	...	...	...
4	...	...	2,144	25,725	...	...	...	...	...	...
5	...	...	2,289	27,468	...	...	4	89	...	...
6	...	...	2,192	26,298	...	...	[4]†7	155	...	...
7	...	...	3,956	47,466	...	...	[4]†1	15	...	...
8	...	...	3,618	43,410	...	...	...	...	...	...
9	...	...	2,775	33,300	...	...	...	...	...	...
1880	...	...	1,921	15,368	...	...	[4]†5	89	...	...
1	...	...	1,401	11,204	...	...	[4]†1	20	...	...
2	...	...	1,794	14,348	...	...	...	...	...	...
3	...	...	1,038	7,266	...	...	...	...	...	...
4	...	...	696	4,872	...	...	...	...	...	...
5	...	...	465	3,255	...	...	...	...	...	...
6	...	...	611	4,277	...	...	...	...	...	...
7	...	...	471	4,710	...	...	[4]†6	120	...	...
8	...	...	532	5,320	...	...	[4]†2	40	...	...
9	...	...	250	2,500	...	...	...	...	...	...
1890	...	...	214	2,135	...	...	...	...	...	...
1	...	...	25	250	...	...	...	...	...	...
2	...	...	30	150	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	[2]†	4	...	...	[4]†1	11	...	...
8	...	...	5	33	...	...	...	...	...	...
9	...	...	16	96	...	...	77	1,077	...	...
1900	28,749	3,594	27	242	...	...	...	...	...	...
1	60,869	7,609	...	...	...	...	...	...	...	...
2	83,293	9,190	...	...	...	...	...	...	...	...
3	168,113	19,153	...	...	...	...	...	...	...	...
4	399,190	45,912	...	...	...	...	...	...	...	...
5	359,744	44,278	...	...	...	...	...	...	...	...
6	282,145	37,612	...	...	...	...	...	...	...	...
7	189,265	25,382	...	...	211	1,866	...	...	73	3,390
8	168,455	18,877	...	...	518	5,006	...	...	11	98
9	176,843	18,778	...	...	211	1,199	...	...	19	244
1910	176,139	18,777	248	1,433	...	...	...	...	12	147
1	169,043	18,333	1,549	15,002	...	...	...	...	12	189
2	165,371	19,725	1,868	22,270	...	...	...	...	14	217
3	188,020	23,420	3,169	59,002	...	...	...	...	...	...
4	193,057	23,227	3,554	46,285	...	...	...	...	22	379
5	222,159	24,295	...	...	2,883	39,032	13	302	7	143
6	173,012	22,258	...	...	428	12,033	3,523	74,930	14	630
7	222,075	38,339	...	...	22	593	4,661	139,940	...	...
8	109,830	22,711	...	...	282	3,045	5,489	163,880	...	...
9	223,332	55,342	...	...	248	3,704	1,780	48,462	...	...
1920	130,692	36,605	...	...	3,427	84,743	1,930	69,136	...	...
1921	116,151	18,658	...	...	...	...	2,156	48,863	...	...
1922	118,696	18,164	...	...	...	...	2,796	69,528	...	...
1923	109,005	16,036	...	...	3,172	43,416	20	609	...	...
1924	89,146	13,409	...	...	4,854	83,095	...	...	...	...
1925	81,226	11,661	...	...	4,664	103,300	...	...	...	...
1926	68,413	8,863	...	...	4,162	76,741	...	...	...	...
1927	49,895	5,829	...	...	1,413	24,592	...	...	...	...
1928	55,554	6,638	...	...	248	4,198	...	...	...	...
1929	49,834	5,509	...	...	444	7,016	...	...	...	...
Total ...	4,627,316	638,184	44,032	508,748	27,187	493,579	23,052	628,956	184	5,437

[2]† Weight not stated. [4]† Estimated. ‡ Ore and Concentrates.

entered for EXPORT from 1850 to 1929, inclusive—continued.

Tungsten Ore.				Arsenical Ore.		Tantalite.		Non-Metallic Minerals.				Year.
Wolfram.		Scheelite.						Graphite.		Magnesite.		
State generally.		State generally.		State generally.		State generally.		State generally.		State generally.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	
...	...	...	...	...	...	...	...	...	...	...	...	1850
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1860
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1870
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1880
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1890
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1900
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	1	6	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	18	5,729	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	4	140	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	2†	400	...	...	...	...	8
1	100	...	...	...	...	...	...	...	...	...	...	9
2	190	...	...	...	...	...	...	...	...	...	...	1910
9	826	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
1	86	...	...	...	...	...	...	...	...	...	...	3
½	40	...	...	...	...	...	...	7	40	...	...	4
¼	25	...	...	...	...	...	...	...	...	688	1,196	5
1	128	3	438	11	19	47	9,375	21	284	12	47	6
...	...	½	42	57	707	17	2,513	18	158	42	50	7
¼	31	5	720	679	2,564	...	...	5	75	62	225	8
¼	15	6	772	...	...	¼	75	...	...	...	...	9
...	...	2½	395	1,765	4,260	...	...	13	130	...	...	1920
...	...	...	...	7	16	...	...	...	...	...	...	1921
...	...	...	...	1,075	1,784	...	...	2†	3	...	...	1922
...	...	...	...	**	686	4½	688	...	...	2	8	1923
...	...	...	...	**	777	...	...	...	...	...	...	1924
...	...	...	...	**	1,045	5	1,010	...	...	...	...	1925
...	...	...	...	**	347	24½	5,751	...	...	...	...	1926
...	...	...	...	**	819	17	3,746	...	...	...	...	1927
...	...	...	...	**	401	11	2,749	...	...	...	...	1928
...	...	...	...	...	...	24	7,106	...	...	...	...	1929
15	1,441	21	2,507	...	13,425	...	39,142	...	696	806	1,526	Total.

** Contained in Gold ore. 2† Weight not stated.

TABLE XXVI.—*Return of Ore and Minerals other than Gold*

Year.	Non-Metallic Minerals—*continued.*						Minerals not Elsewhere Included.		Total Value of Minerals other than Gold exported to Date.	Year.
	Asbestos.		Coal.		Mica.					
	State generally.		Collie River Mf.		State generally.					
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
	tons.	£	tons.	£	tons.	£	tons.	£	£	
1850	...	...	...	...	...	...	...	...	55	1850
1	...	...	...	...	...	...	...	...	...	1
2	...	...	...	...	...	...	...	...	...	2
3	...	...	...	...	...	...	...	...	1,211	3
4	...	...	...	...	...	...	...	...	2,440	4
5	...	...	...	...	...	...	...	...	2,951	5
6	...	...	...	...	...	...	...	...	2,218	6
7	...	...	...	...	...	...	...	...	4,330	7
8	...	...	...	...	...	...	...	...	10,751	8
9	...	...	...	...	...	...	...	...	14,752	9
1860	...	...	...	...	...	...	...	...	9,006	1860
1	...	...	...	...	...	...	...	...	7,129	1
2	...	...	...	...	...	...	...	...	12,626	2
3	...	...	...	...	...	...	...	...	14,508	3
4	...	...	...	...	...	...	...	...	18,016	4
5	...	...	...	...	...	...	...	...	21,726	5
6	...	...	...	...	...	...	...	...	11,644	6
7	...	...	...	...	...	...	...	...	15,929	7
8	...	...	...	...	...	...	...	...	14,451	8
9	...	...	...	...	...	...	...	...	10,719	9
1870	...	...	...	...	...	...	...	...	14,604	1870
1	...	...	...	...	...	...	...	...	5,040	1
2	...	...	...	...	...	...	...	...	4,368	2
3	...	...	...	...	...	...	...	...	12,434	3
4	...	...	...	...	...	...	...	...	26,723	4
5	...	...	...	...	...	...	...	...	30,628	5
6	...	...	...	...	...	...	...	...	30,638	6
7	...	...	...	...	...	...	...	...	48,284	7
8	...	...	...	...	...	...	...	...	43,545	8
9	...	...	...	...	...	...	...	...	33,300	9
1880	...	...	...	...	...	...	...	...	15,577	1880
1	...	...	...	...	...	...	...	...	11,224	1
2	...	...	...	...	...	...	...	...	14,371	2
3	...	...	...	...	...	...	...	...	7,341	3
4	...	...	...	...	...	...	...	...	6,642	4
5	...	...	...	...	...	...	...	...	5,048	5
6	...	...	...	...	...	...	...	...	8,012	6
7	...	...	...	...	...	...	...	...	5,175	7
8	...	...	...	...	...	...	...	...	6,848	8
9	...	...	...	...	...	...	...	...	4,704	9
Carried forward ...	...	...	...	...	...	...	...	...	508,968	...

entered for EXPORT from 1850 to 1929, inclusive—continued.

Year.	Non-Metallic Minerals—*continued.*						Minerals not Elsewhere Included.		Total Value of Minerals other than Gold exported to Date.	Year.
	Asbestos. State generally.		Coal. Collie River Mf.		Mica. State generally.					
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
	tons.	£	tons.	£	tons	£	tons	£	£	
Brought forward	...	...	...	...	...	...	...	...	508,968	
1890	...	...	...	...	...	...	...	...	7,671	1890
1	...	...	...	...	...	...	...	...	14,912	1
2	...	...	...	...	[2]†	25	...	...	22,714	2
3	...	...	...	...	[2]†	4	...	...	11,744	3
4	...	...	...	...	...	...	...	...	15,274	4
5	...	...	...	...	[2]†	3	...	...	22,658	5
6	...	...	...	...	...	...	...	...	4,438	6
7	...	...	...	...	[2]†	209	...	...	4,532	7
8	...	...	1	1	...	...	...	...	7,060	8
9	...	[2]†	1 798	772	[2]†	50	...	...	66,611	9
1900	...	...	355	350	[2]†	3	5	85	95,261	1900
1	...	...	971	969	...	...	...	4	171,453	1
2	...	...	12	12	...	...	[6]†2	41	61,551	2
3	...	[5]† 10	110	127	...	...	[7]† 22	230	109,468	3
4	...	...	11	7	...	...	7	81	97,132	4
5	...	...	108	87	...	...	62	127	192,251	5
6	...	...	86	65	...	...	10	1,035	222,621	6
7	...	...	26 *1,447	28 1,138	...	...	[8]†96	1,447	402,906	7
8	...	[2]†	1,242	13 *9,612	11 7,747	[2]†	10	42	2,750	176,827	8
9	...	...	...	353 *85,647	183 93,781	...	...	[9]† 263	735	282,650	9
1910	...	...	...	3 *48,876	2 38,400	...	...	½	100	200,106	1910
1	...	...	...	*40,063	29,344	...	...	[10]†14	407	197,439	1
2	...	...	...	6 *42,602	6 30,721	...	...	[11]†	8	212,509	2
3	...	...	...	*54,228	39,125	...	...	5	17	336,155	3
4	...	...	...	*54,416	38,244	4	323	[12]† 9	635	182,996	4
5	...	...	...	1,667 *26,167	1,513 19,288	[2]†	26	[13]†	115	218,495	5
6	...	...	...	2,447 *37,590	1,857 28,387	[2]†	10	[14]†	713	265,043	6
7	...	...	...	*31,951	29,359	...	...	[15]†	440	343,167	7
8	...	...	1	25	*23,238	24,424	...	...	[16]† 5	97	360,895	8
9	...	...	36	752	*69,708	76,924	1	514	[17]†	116	244,050	9
1920	...	...	31	2,525	*78,788	104,665	[18]†	120	[19]†	223	377,416	1920
1921	...	...	141	6,205	*116.993	188,686	...	...	[20]†	257	293,771	1921
1922	...	...	143	5,746	*71,164	115,835	2	60	[21]†	1,083	243,512	1922
1923	...	...	71	3,830	5,313 *43,729	7,969 73,256	...	...	[22]†	303	226,996	1923
1924	...	...	32	1,586	*36,829	60,292	...	...	[23]† 20	160	212,003	1924
1925	...	...	23	687	66 *37.208	198 58,650	...	...	...	...	210,143	1925
1926	...	...	63	1,823	*50,986	82,810	4	8,328	[24]†	838	196,035	1926
1927	...	...	11	908	*39,089	62,297	4	536	[25]†	418	112,562	1927
1928	...	...	13	1,352	*26,194 28	42,224 26	...	...	[26]†	71	73,426	1928
1929	...	...	195	17,452	39,273	63,767	...	...	[27]†	569	117,629	1929
Total	...	...	...	44,144	1,078,162	1,323,547	...	10,221	...	13,015	7,123,050	Total

* Bunker Coal. [3] †Weight not stated. [5] †4 cwts. [6] †Cobalt ore.

[8] †Includes—
Antimony ore, 25 tons = £630
N.E.I., 71 tons ... = 817
Total £1,447

[9] †Includes—
Other Concentrates, 29 tons = £108
N.E.I., 234 tons ... = 627
Total £735

[10] †Includes—
Iron ore, 9 tons ... = £7
Ores, N.E.I., 5 tons = 400
Total £407

[11] †Includes—
Manganese, 2 tons = £4
N.E.I. ... ... = 4
Total £8

[12] †Bismuth.

[13] †Includes—
Bismuth, 1 ton ... = £37
Fireclay, 12 tons ... = 75
Manganese, 3 cwt. = 3
Total £115

[14] †Includes—
Antimony, 27 tons = £580
Bismuth, 4 cwt. ... = 133
Total £713

[15] †Molybdenite.

[16] †Includes—
Antimony, 12 tons = £258
Bismuth, 9cwt. ... = 24
Molybdenite, 14 tons = 158
Total £440

[17] †Includes—
Bismuth, 1 cwt. ... = £15
Corundum, 1 ton ... = 1
Molybdenite, 7 tons = 100
Total £116

[18] †7 cwts.

[19] †Includes—
Antimony, 2½ tons = £45
Clay, 6 cwt. ... = 6
Gadolinite, 1 ton ... = 150
Iron Concentrates, 1 ton = 17
Molybdenite, 10 cwt. = 5
Total £223

[20] †Includes—
Barytes, 2 cwt. ... = £18
Corundum, ½ cwt. = 2
Felspar, 1 ton ... = 47
Jarosite, 12 cwt. ... = 5
Manganese, 16 tons = 145
Pottery Clay, 3½ tons = 40
Total £257

[21] †Includes—
Barytes, 19 tons ... = £73
Felspar, 60 tons ... = 485
Gypsum, 2 tons ... = 4
Molybdenite, 51 tons = 505
Pottery clay, 1 ton = 16
Total ... £1,083

[22] †Includes—
Clay, 34 tons ... = £94
Iron Ore, 2 tons ... = 9
Manganese, 22 tons = 200
Total £303

[23] †Manganese.

[24] †Includes—
Antimony, 4½ tons = £85
Felspar, 8¼ tons ... = 250
Manganese 82 tons = 503
£838

[25] †Includes—
Gypsum 2 cwts ... = £1
Manganese, 30 tons = 303
Pottery Clay, 35 tons = 114
Total £418

[26] †Includes—
Iron, 1 ton... ... = £1
Sulphur** ... ... = 70
Total £71

[27] †Includes—
Alunite, 38 tons ... = £194
Barytes, 2 tons ... = 8
Felspar, 21 tons ... = 96
Manganese, 80 tons = 230
Pottery Clay, 2 cwt. = 5
Sand, 18 tons ... = 36
Total £569

**Contained in gold ore.

PART III.—ALL MINES.

TABLE XXVII.

MILLING AND CYANIDING PLANTS ERECTED IN THE RESPECTIVE GOLDFIELDS, DISTRICTS, AND MINERAL FIELDS ON THE 31ST DECEMBER, 1929, AND THE TOTAL VALUE OF MINING MACHINERY.

Mining Centre and Lease or Area.	Name of Mine, Company, or Works.	Milling.									Cyaniding.			Value of all Mining Machinery
		Batteries.	Other Mills.											
		Number of Heads of Stampers.	Prospecting Mills.	Ball Mills.	Grillin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	
	PILBARA GOLDFIELD.													
	MARBLE BAR DISTRICT.													
Bamboo Creek. G.M.L. (795)	Bulletin	10	...	...	...	...	...	...	...	...	...	...	...	...
Lalla Rookh. R.C. 112	State Battery, Bamboo Creek	5	...	...	...	...	...	...	...	1	5	...	...	...
Marble Bar. M.A. 37	Lalla Rookh	10	...	...	...	...	...	...	...	...	5	...	...	...
G.M.L. (694)	Ironclad	10	...	...	...	...	...	...	...	...	...	...	...	...
	Jo Jo	5	...	...	...	1	...	...	...	1	...	...	...	...
	State Battery, Marble Bar	5	...	...	...	...	...	...	...	1	...	...	...	...
	Total	**45**	...	...	...	**1**	...	...	...	**3**	**10**	...	...	**£9,601**
	NULLAGINE DISTRICT.													
Eastern Creek. G.M.L. 219L	Shamrock	3	...	...	...	...	...	...	...	...	3	...	...	...
20-Mile Sandy.	State Battery, 20-Mile Sandy	5	...	...	...	...	...	...	...	...	...	...	...	...
	Total	**8**	...	...	...	...	...	...	...	...	**3**	...	...	**£1,792**
	PEAK HILL GOLDFIELD.													
Mount Egerton.	State Battery, Mount Egerton	5	...	...	...	...	...	...	...	...	...	...	...	...
Peak Hill. T.A. 6P	Wind Power Cyanide Works	...	...	...	...	...	...	...	...	...	6	...	...	...
	State Battery, Peak Hill	5	...	...	...	...	...	...	...	1	3	...	...	...
	Total	**10**	...	...	...	...	...	...	...	**1**	**9**	...	...	**£2,675**
	EAST MURCHISON GOLDFIELD.													
	LAWLERS DISTRICT.													
Kathleen Valley. G.M.L. (382)	Yellow Aster	...	...	...	...	...	...	...	...	...	2	...	...	...
Lawlers. M.A. (32)	Great Eastern	5	...	...	...	...	...	...	...	1	...	...	...	...
M.A. 11	Sands Retreatment Works	...	...	...	...	...	...	...	...	...	4	...	...	...
G.M.L. 1236	Waroonga G.M. Co., Ltd.	10	...	...	...	...	...	1	...	...	4	...	...	...
Sir Samuel.	State Battery, Sir Samuel	5	...	...	...	...	...	...	...	...	4	...	...	...
	Total	**20**	...	...	...	...	...	**1**	...	**1**	**14**	...	...	**£4,995**
	WILUNA DISTRICT.													
Corboy's Find. M.A. 3J	Tuscana Battery	3	...	...	...	...	...	...	...	...	2	...	...	...
G.M.L. 359J	Corboy's Reward North	5	...	...	...	...	...	...	...	...	3	...	...	...
Mt. Keith.	State Battery, Mt. Keith	5	...	...	...	...	...	...	...	...	...	...	...	...
Wiluna.	State Battery, Wiluna	10	...	...	...	...	...	1	...	...	6	...	...	...
	Total	**23**	...	...	...	...	...	**1**	...	...	**11**	...	...	**£50,802**
	BLACK RANGE DISTRICT.													
Sandstone.	State Battery, Sandstone	10	...	...	...	...	...	...	...	...	6	...	...	...
Youanmi.	State Battery, Youanmi	5	...	...	...	...	...	...	...	...	5	...	...	...
	Total	**15**	...	...	...	...	...	...	...	...	**11**	...	...	**£4,678**
	MURCHISON GOLDFIELD.													
	CUE DISTRICT.													
Cue.	State Battery, Cue	5	...	...	...	...	...	...	...	1	5	...	...	...
Reedy's Find. G.M.L. 1977	Mararoa G.M. Co., N.L.	5	...	...	...	...	...	...	...	...	9	...	...	...
Tuckanarra.	State Battery, Tuckanarra	10	...	...	...	...	...	...	...	...	3	...	...	...
	Total	**20**	...	...	...	...	...	...	...	**1**	**17**	...	...	**£5,988**
	MEEKATHARRA DISTRICT.													
Holden's Find. G.M.L. 1291N	Waterloo G.M. Co., N.L.	5	...	...	...	...	...	...	...	1	...	...	...	...
Meekatharra. G.M.L. 477N	Fenian	15	...	...	...	...	...	...	...	4	...	...	...	...
G.M.L. 475N	Ingliston Consols Extended	15	...	...	...	...	...	...	...	3	...	...	...	...
G.M.L. 1531N	Ingliston G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...
G.M.L. 1520N	Prohibition G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...
	State Battery, Meekatharra	5	...	...	...	...	...	...	...	1	4	...	...	...
	Total	**60**	...	...	...	...	...	...	...	**9**	**9**	...	...	**£39,222**

TABLE XXVII.—*Milling and Cyaniding Plants erected in the respective Goldfields, Districts, etc.*—continued.

Mining Centre and Lease or Area.	Name of Mine, Company, or Works.	Milling. Batteries. Number of Heads of Stampers.	Milling. Other Mills. Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	Cyaniding. Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	Value of all Mining Machinery.
	MURCHISON GOLDFIELD—*continued.*													
	DAY DAWN DISTRICT.													
Lake Austin. G.M.L. 1P	South Fingall	...	...	...	...	...	...	...	...	...	6	...	...	...
	Total	...	...	...	...	...	...	...	...	...	6	...	...	£1,580
	MT. MAGNET DISTRICT.													
Lennonville. G.M.L. 964M	Empress	5	...	...	...	...	...	...	...	1	3	...	...	...
Mt. Magnet. G.M.L. 1231M	Hill Crest	...	...	...	...	1	...	...	...	2	...	...	...	...
G.M.L. 1215M	Hill 60	5	...	...	...	...	...	...	...	...	5	...	...	...
G.M.L. 1075M	New Havelock	5	...	...	...	...	...	...	...	1	3	...	...	...
⋀	State Battery, Boogardie	5	...	...	...	...	...	...	...	1	5	...	...	...
	Total	20	...	...	...	1	...	...	...	5	16	...	...	£8,478
	YALGOO GOLDFIELD.													
Field's Find. M.A. 23	Brown's Reward	5	...	...	...	...	...	...	...	...	6	...	...	...
Goodingnow. ⋀	State Battery, Payne's Find	5	...	...	...	...	...	...	...	1	3	...	...	...
Messenger's Patch. G.M.L. 880	Brilliant G.M. Co., N.L.	10	...	...	...	...	...	...	...	2	...	...	...	...
Noongal. G.M.L. 953	Revival	5	...	...	...	...	...	...	...	...	...	...	...	...
Warda Warra. G.M.L. 1001	Western Queen	4	...	...	...	...	...	...	...	...	...	...	...	...
Warriedar. ⋀	State Battery, Warriedar	5	...	...	...	...	...	...	...	1	6	...	...	...
	Total	34	...	...	...	...	...	...	...	4	15	...	...	£13,919
	MOUNT MARGARET GOLDFIELD.													
	MT. MORGANS DISTRICT.													
Linden. ⋀	State Battery, Linden	10	...	...	...	...	...	...	...	1	6	...	...	...
G.M.L. 341F	Torquay	5	...	...	...	...	...	...	...	1	6	...	...	...
G.M.L. 5F	Westralian Mt Morgans Mines, N.L.	10	...	...	...	...	1	...	...	3	...	6	1	...
	Total	25	...	...	...	...	1	...	...	5	12	6	1	£13,169
	MT. MALCOLM DISTRICT.													
Lake Darlot. ⋀	State Battery, Lake Darlot	10	...	...	...	...	...	...	...	...	...	...	...	...
Leonora. G.M.L.190C,etc.	Sons of Gwalia, Ltd.	30	...	...	...	...	...	...	4	...	...	4	1	...
⋀	State Battery, Leonora	10	...	...	...	...	...	...	...	2	6	...	...	...
Mt. Clifford. G.M.L. 1329C	Victory No. 1	5	...	...	...	...	...	...	...	...	...	...	...	...
Pig Well. G.M.L. 1547C	Starlight	10	...	...	...	...	...	...	...	1	...	...	...	...
	Total	65	...	...	...	...	...	...	4	3	6	4	1	£289,744
	MT. MARGARET DISTRICT.													
Erlistoun. G.M.L. 2113T	Baneygo North	5	...	...	...	...	...	...	...	1	...	...	...	...
G.M.L. 2141T	King of Creation	5	...	...	...	...	...	...	...	...	...	...	...	...
Laverton. G.M.L. 715T	Lancefield Treatment Syndicate	...	...	...	...	...	...	...	...	...	8	...	...	...
⋀	State Battery, Laverton	10	...	...	...	...	...	...	...	1	5	...	...	...
	Total	20	...	...	...	...	...	...	...	2	13	...	...	£4,344
	NORTH COOLGARDIE GOLDFIELD.													
	MENZIES DISTRICT.													
Comet Vale. G.M.L. 5217Z	Sand Queen Gladsome Mines, N.L.	10	...	...	...	...	...	1	...	3	6	...	...	...
Menzies. M.A. 65	Lady Harriet	5	...	...	...	...	...	...	...	...	3	...	...	...
Mt. Ida. ⋀	State Battery, Mt. Ida	5	...	...	...	...	...	...	...	...	...	...	...	...
	Total	20	...	...	...	...	...	1	...	3	9	...	...	£19,012
	ULARRING DISTRICT.													
Mulline. ⋀	State Battery, Mulline	10	...	...	...	...	...	...	...	...	...	...	...	...
G.M.L. 998U	Riverina Proprietary, N.L.	10	...	...	...	...	...	...	...	2	6	...	...	...
	Total	20	...	...	...	...	...	...	...	2	6	...	...	£8,912
	NIAGARA DISTRICT.													
Niagara. ⋀	State Battery, Niagara	10	...	...	...	...	...	...	...	...	...	...	...	...
	Total	10	...	...	...	...	...	...	...	...	...	...	...	£1,408

TABLE XXVII.—*Milling and Cyaniding Plants erected in the respective Goldfields, Districts, etc.*—continued.

Mining Centre and Lease or Area.	Name of Mine, Company, or Works.	Milling.								Cyaniding.			Value of all Mining Machinery
		Batteries.	Other Mills.										
		Number of Heads of Stampers.	Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	Leaching Va's.	Agitating Vats.	Vacuum Filters and Presses.	
	NORTH COOLGARDIE GOLDFIELD— *continued.*												
	YERILLA DISTRICT.												
Edjudina. G.M.L. 1011R	Neta	10	...	...	...	...	...	...	...	1	3	...	...	...
Yarri. ⋀	State Battery, Yarri	10	...	...	...	...	...	...	...	...	6	...	...	...
	Total	**20**	...	...	...	...	...	...	...	**1**	**9**	...	...	**£2,540**
	BROAD ARROW GOLDFIELD.												
Bardoc, G.M.L. 1383W	Zoroastrian	5	...	...	...	...	...	...	...	...	...	...	...	...
Siberia. G.M.L. 1386W	Associated Northern Blocks (W.A.), Ltd.	...	...	1	1	2	...	5	...	10	...	7	3	...
G.M.L. 1289W	Lady Evelyn	5	...	...	...	...	...	...	...	...	4	...	...	...
⋀	State Battery, Ora Banda	5	...	...	...	...	...	...	...	1	5	...	...	...
⋀	State Battery, Siberia	5	...	...	...	...	...	...	...	...	...	...	...	...
	Total	**20**	...	1	1	2	...	5	...	11	9	7	3	**£61,432**
	NORTH-EAST COOLGARDIE GOLDFIELD.												
	KANOWNA DISTRICT.												
Gordon. G.M.L. (1470X)	Sirdar	...	...	...	...	1	...	...	...	1	4	...	...	...
G.M.L. 1389X	Golden Valley	5	...	...	...	...	...	...	...	1	...	...	...	...
	Total	**5**	...	...	...	1	...	...	...	**2**	**4**	...	...	**£1,650**
	KURNALPI DISTRICT.												
Kurnalpi. P.A. 273	Success Battery	5	...	...	...	...	...	...	...	...	...	...	...	...
Mulgabbie. M.A. 4K	Simmon's Battery	...	1	...	...	...	...	...	...	...	...	...	...	...
	Total	**5**	**1**	...	...	...	...	...	...	...	...	...	...	**£200**
	EAST COOLGARDIE GOLDFIELD.												
	EAST COOLGARDIE DISTRICT.												
Boulder. G.M.L. 38E, etc.	Associated G.Ms. of W.A., Ltd.	...	...	7	...	...	...	1	...	20	...	6	7	...
G.M.L. 66E	Boulder Perseverance, Ltd.	...	...	8	...	...	...	4	2	17	...	24	13	...
M.A. 71E	Great Boulder No. 1, Ltd.	10	...	...	...	...	...	...	...	...	2	...	...	...
G.M.L. 16E	Great Boulder Proprietary G.Ms., Ltd.	...	1	6	...	...	2	4	...	20	...	22	7	...
G.M.L. 31E	Lake View and Star, Ltd.	10	...	9	...	...	...	...	3	2	...	30	5	...
G.M.L. 410E	North Kalgurli (1912), Ltd.	70	...	9	...	...	1	...	3	18	...	...	...	...
G.M.L. 1208E	South Kalgurli Consolidated, Ltd.	...	...	4	...	...	...	...	1	6	...	6	6	...
T.A. 75E	Fraser's Treatment Works	...	...	...	...	...	...	...	...	...	8	...	...	...
Hampton Plains Block 48, P.P.L. 1	White Hope	10	...	...	...	...	...	...	...	...	1	...	2	...
Kalgoorlie. G.M.L. 4547E	Hannans Reward	5	...	...	...	...	...	...	...	2	3	...	...	...
Wombola. G.M.L. 4766E	Great Hope	...	...	...	...	1	...	1	...	1	3	...	...	...
	Total	**105**	**1**	**43**	...	**1**	**3**	**10**	**9**	**87**	**16**	**90**	**38**	**£526,550**
	BULONG DISTRICT	...	...	...	...	...	...	...	...	...	...	...	...	**£500**
	COOLGARDIE GOLDFIELD.												
	COOLGARDIE DISTRICT.												
Coolgardie. G.M.L. 4567	Griffith's Gold Mine	10	...	...	...	...	...	...	...	...	6	...	...	...
⋀	State Battery, Coolgardie	10	...	...	...	...	...	...	...	...	6	...	...	...
M.A. 82	Reform Battery	5	...	...	...	...	...	...	...	...	3	...	...	...
St. Ives. G.M.L. 4720	Ives Reward G.Ms., N.L.	10	...	...	...	...	...	...	...	3	...	...	...	...
G.M.L. 4732	Ives Reward Junction	...	...	...	...	1	...	...	...	...	4	...	...	...
⋀	State Battery, St. Ives	5	...	...	...	...	...	...	...	1	5	...	...	...
M.A. 280H	Imperial Battery	5	...	...	...	...	...	...	...	...	2	...	...	...
	Total	**45**	...	...	...	**1**	...	...	...	**4**	**26**	...	...	**£20: 18**
	KUNANALLING DISTRICT.												
Carbine. G.M.L. 33S	Carbine	10	...	...	...	...	...	...	...	2	...	...	...	...
25-Mile. G.M.L. 696S	Blue Bell	5	...	...	...	...	...	...	...	...	6	...	...	...
G.M.L. 645S	Star of Fremantle	10	...	...	...	...	...	...	...	...	2	...	...	...
	Total	**25**	...	...	...	...	...	...	...	2	**8**	...	...	**£4,320**

TABLE XXVII.—*Milling and Cyaniding Plants erected in the respective Goldfields, Districts, etc.*—continued.

Mining Centre and Lease or Area.	Name of Mine, Company, or Works.	MILLING.									CYANIDING.			Value of all Mining Machinery.
		Batteries.	Other Mills.											
		Number of Heads of Stampers.	Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	
	YILGARN GOLDFIELD.													
Bullfinch.														
G.M.L. 3345	Copperhead	5	...	...	...	...	...	...	...	...	...	...	...	...
Golden Valley.														
G.M.L. 3311	Great Bingin	3	...	...	...	...	...	...	...	...	...	...	...	...
G.M.L. 2994	Radio	5	...	...	...	...	...	...	...	...	3	...	...	...
G.M.L. 3248	Radio Deeps	5	...	...	...	...	...	...	...	...	3	...	...	...
Holleton.														
G.M.L. 3312	North End	5	...	...	...	...	...	1	...	1	...	...	...	...
Marvel Loch.														
M.A. 23	Howlett's Battery	5	...	...	...	...	...	...	...	...	3	...	...	...
G.M.L. 852	May Queen.	5	...	...	...	...	...	...	...	1	...	...	...	...
Parker's Range.														
G.M.L. 2801	Scots Greys	5	...	...	...	...	...	...	...	...	...	...	...	...
G.M.L. 724	Spring Hill	10	...	...	...	...	...	...	...	1	4	...	...	...
Westonia.														
G.M.L. 3308	Consolidated	5	...	...	...	...	...	...	...	...	...	...	...	...
G.M.L. 3349	Edna May Central	...	...	...	...	...	...	...	...	...	8	...	...	...
P.A.	Recovery Battery	5	...	...	...	...	...	...	...	...	...	...	...	...
	Total	**58**	...	...	...	...	...	**1**	...	**3**	**21**	...	...	**£14,598**
	DUNDAS GOLDFIELD.													
Norseman.														
G.M.L. 1291	Mararoa No. 1	10	...	...	...	...	...	...	...	...	7	...	...	...
M.A. 18	Rawlings & Bullen	10	...	...	...	...	...	...	...	3	...	...	...	...
⅄	State Battery, Norseman	5	...	...	...	...	...	...	...	1	6	...	...	...
	Total	**25**	...	...	...	...	...	...	...	**4**	**13**	...	...	**£7,288**
	PHILLIPS RIVER GOLDFIELD.													
Kundip.														
M.A. 6	Gem	5	...	...	...	...	...	...	...	...	...	...	...	...
G.M.L. (151)	Gem Consolidated	5	...	...	...	...	...	...	...	...	...	...	...	...
M.L. 52	Harbour View	10	...	...	...	...	...	...	...	...	...	...	...	...
T.A. 6	Two Boys	10	...	...	...	...	...	...	...	...	...	...	...	...
P.A. 202	Cherighan	...	...	...	...	...	...	...	...	...	4	...	...	...
	Total	**30**	...	...	...	...	...	...	...	...	**4**	...	...	**£2,040**

TABLE XXVII.—*Milling and Cyaniding Plants erected in the respective Goldfields, Districts, etc.*—continued.

GOLDFIELD	DISTRICT.	MILLING. Batteries. Number of Heads of Stampers.	MILLING. Other Mills. Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	CYANIDING. Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	Value of all Mining Machinery.
														£
	GOLD MINING.													
Pilbara	Marble Bar	45	...	...	...	1	...	...	...	3	10	...	...	9,601
	Nullagine	8	...	...	...	...	...	...	...	...	3	...	...	1,792
Peak Hill	... ...	10	...	...	...	...	...	...	...	1	9	...	...	2,675
East Murchison	Lawlers	20	...	...	...	...	...	1	...	1	14	...	...	4,995
	Wiluna	23	...	...	...	...	...	1	...	...	11	...	...	50,802
	Black Range	15	...	...	...	...	...	...	...	...	11	...	...	4,678
	Cue	20	...	...	...	...	...	...	...	1	17	...	...	5,988
	Meekatharra	60	...	...	...	...	...	...	...	9	9	...	...	39,222
Murchison ...	Day Dawn	...	...	...	...	...	...	...	...	...	6	...	...	1,530
	Mt. Magnet	20	...	...	...	1	...	...	...	5	16	...	...	8,478
Yalgoo	... ...	34	...	...	...	...	...	...	...	4	15	...	...	13,919
Mt. Morgans ...	Mt. Morgans	25	...	...	...	...	1	...	...	5	12	6	1	13,169
	Mt. Malcolm	65	...	...	...	...	...	...	4	3	6	4	1	289,744
	Mt. Margaret	20	...	...	...	...	...	...	...	2	13	...	...	4,344
	Menzies	20	...	...	...	...	...	1	...	3	9	...	...	19,012
	Ularring	20	...	...	...	...	...	...	...	2	6	...	...	8,912
North Coolgardie	Niagara	10	...	...	...	...	...	...	...	...	...	...	...	1,408
	Yerilla	20	...	...	...	...	...	...	...	1	9	...	...	2,540
Broad Arrow	... ...	20	...	1	1	2	...	5	...	11	9	7	3	61,432
North-East Coolgardie	Kanowna	5	...	...	...	1	...	...	...	2	4	...	...	1,650
	Kurnalpi	5	1	...	...	...	...	...	...	...	...	...	...	200
East Coolgardie	East Coolgardie	105	1	43	...	1	3	10	9	87	16	90	38	526,550
	Bulong	...	...	...	...	...	...	...	...	...	...	...	...	500
Coolgardie ...	Coolgardie	45	...	...	...	1	...	...	...	4	26	...	...	20,918
	Kunanalling	25	...	...	...	...	...	...	...	2	8	...	...	4,820
Yilgarn	... ...	58	...	...	...	...	...	1	...	3	21	...	...	14,598
Dundas	... ...	25	...	...	...	...	...	...	...	4	13	...	...	7,288
Phillips River	... ...	30	...	...	...	...	...	...	...	...	4	...	...	2,040
	Total, Gold Mining Machinery ...	**753**	2	**44**	**1**	**7**	**4**	**19**	**13**	**153**	**277**	**107**	**43**	**£1,122,805**
	LEAD MINING.													
	... ...	...	...	...	...	...	...	9	...	...	...	...	...	...
Northampton M.F. ...	**Total, Lead Mining Machinery ...**	...	...	...	...	...	...	**9**	...	...	...	...	...	**£41,781**
	TIN MINING.													
Pilbara	Marble Bar	...	...	...	...	...	1	2	...	...	...	...	...	2,136
Greenbushes	... ...	...	...	...	...	...	1	2	...	...	...	...	...	10,788
	Total, Tin Mining Machinery ...	...	...	...	...	...	2	**4**	...	...	...	...	...	**£12,924**
	COPPER MINING.													
West Pilbara	... ...	...	...	...	...	...	...	5	2	1	...	...	...	41,310
Phillips River	... ...	...	...	5	...	...	...	10	2	...	...	...	...	51,940
	Total, Copper Mining Machinery	...	...	**5**	...	...	...	**15**	**4**	**1**	...	...	...	**£93,250**
	COAL MINING.													
Collie	... ...	...	...	...	...	...	...	...	...	...	...	...	...	97,330
	Total, Coal Mining Machinery ...	...	...	...	...	...	...	...	...	...	...	...	...	**£97,330**
	ASBESTOS MINING.													
Pilbara	Nullagine	...	...	...	...	...	...	1	...	...	...	...	...	1,894
	Marble Bar	...	...	...	...	...	...	1	...	1	...	...	...	800
	Total, Asbestos Mining Machinery	...	...	...	...	...	...	**2**	...	**1**	...	...	...	**£2,694**
	TANTALITE MINING.													
Pilbara	Marble Bar	...	...	...	...	...	...	...	...	...	...	...	...	4,400
	Total, Tantalite Mining Machinery	...	...	...	...	...	...	...	...	...	...	...	...	**£4,400**
	GYPSUM MINING.													
Yilgarn	... ...	...	...	...	...	...	...	...	1	...	...	...	...	...
State generally	... ...	...	...	...	...	...	...	1	...	...	...	...	...	...
	Total, Gypsum Mining Machinery	...	...	...	...	...	...	1	**1**	...	...	...	...	**£16,000**
	Total, Machinery other than Gold Mining	...	...	5	...	...	2	31	5	2	...	...	...	268,379
	Total, all Mining Machinery	**753**	2	49	1	7	6	50	18	155	277	107	43	**£1,391,184**

APPENDIX.

ROYAL MINT, PERTH BRANCH.

Subject to the Regulations, any person may deposit gold at the Mint in his own name. Those who cannot attend personally for the purpose may send the gold by an agent, under Police escort, or by Post.

A circular can be obtained from the Deputy Master of the Mint giving all necessary information for intending depositors, Coining Regulations, etc., etc.

Forms for use in connection with gold sent to the Mint by post can be obtained at the Mint.

Gold may be sent through the Post only at letter rates, registered.

Gold posted to the Mint should be well secured, *and the sender's name and address should be inside the parcel.* Alluvial gold or small melted pieces may be wrapped in paper and placed in a tobacco tin or other container. Then the container should be sewn in stout canvas, and the address written on the canvas and on a tag secured to the canvas to carry the postage stamps. The address will be: "The Deputy Master, Royal Mint, Perth."

The parcel should then by sent by registered post. Registration does not render the Postal or any Department liable in case of loss.

IF SO DESIRED BY TELEGRAM FROM THE SENDER, the Mint will insure gold sent to it by registered post. The telegram should be to the following effect:—

Royal Mint Perth.

Have sent you by registered post to-day gold value.....pounds please insure.

(Name of Sender.)

On receipt of such a telegram the Mint, as agent for the sender, will insure the gold with the Commercial Union Assurance Company, Limited, at current rates. The cost of the insurance and of any telegrams involved will be charged to the sender of the gold. The minimum premium payable will be one shilling and sixpence.

In every case the sender should advise the Mint by post. A copy of any telegram on the subject should be attached.

In addition, proceeds can be sent in Bank Notes to prospectors who are in districts where there are no banking facilities. The Mint will insure the package of notes, and charge the depositor with the cost.

Amount of insurance to be taken out under paragraph 4 above will not exceed £500 (five hundred pounds). Prospectors and others who may desire to insure *larger values* are invited to apply to the Mint by telegram before the parcel is sent by registered post. If no previous arrangement is made, the Mint may be unable to insure more than £500.

Charges for Assaying, Refining, and Coinage.

Gross weight of Deposit in ounces.	Mint Charge.	Gross weight of Deposit in ounces.	Mint Charge.	Gross weight of Deposit in ounces.	Mint Charge.
Up to and including—	£ s. d.	Up to and including—	£ s. d.	Up to and including—	£ s. d.
24	0 5 0	400	4 3 4	1,300	10 4 2
30	0 6 3	410	4 5 5	1,400	10 16 8
40	0 8 4	420	4 7 6	1,500	11 9 2
50	0 10 5	430	4 9 7	1,600	12 1 8
60	0 12 6	440	4 11 8	1,700	12 14 2
70	0 14 7	450	4 13 9	1,800	13 6 8
80	0 16 8	460	4 15 10	1,900	13 19 2
90	0 18 9	470	4 17 11	2,000	14 11 8
100	1 0 10	480	5 0 0	2,100	15 4 2
110	1 2 11	490	5 2 1	2,200	15 16 8
120	1 5 0	500	5 4 2	2,300	16 9 2
130	1 7 1	520	5 6 8	2,400	17 1 8
140	1 9 2	540	5 9 2	2,500	17 14 2
150	1 11 3	560	5 11 8	2,600	18 6 8
160	1 13 4	580	5 14 2	2,700	18 19 2
170	1 15 5	600	5 16 8	2,800	19 11 8
180	1 17 6	620	5 19 2	2,900	20 4 2
190	1 19 7	640	6 1 8	3,000	20 16 8
200	2 1 8	660	6 4 2	3,100	21 9 2
210	2 3 9	680	6 6 8	3,200	22 1 8
220	2 5 10	700	6 9 2	3,300	22 14 2
230	2 7 11	720	6 11 8	3,400	23 6 8
240	2 10 0	740	6 14 2	3,500	23 19 2
250	2 12 1	760	6 16 8	3,600	24 11 8
260	2 14 2	780	6 19 2	3,700	25 4 2
270	2 16 3	800	7 1 8	3,800	25 16 8
280	2 18 4	820	7 4 2	3,900	26 9 2
290	3 0 5	840	7 6 8	4,000	27 1 8
300	3 2 6	860	7 9 2	4,100	27 14 2
310	3 4 7	880	7 11 8	4,200	28 6 8
320	3 6 8	900	7 14 2	4,300	28 19 2
330	3 8 9	920	7 16 8	4,400	29 11 8
340	3 10 10	940	7 19 2	4,500	30 4 2
350	3 12 11	960	8 1 8	4,600	30 16 8
360	3 15 0	980	8 4 2	4,700	31 9 2
370	3 17 1	1,000	8 6 8	4,800	32 1 8
380	3 19 2	1,100	8 19 2	4,900	32 14 2
390	4 1 3	1,200	9 11 8	5,000	33 6 8

For every additional 100ozs. the charge is increased by 12s. 6d.

NOTE.—Additional charges are collected when base metals in a deposit exceed 2 per cent. of its weight.

The following table illustrates the operation of these charges in case of gold of the value of £3 17s. 10½d. an ounce:—

Weight of Deposit	Rate of Charge per ounce.	Amount of Charge.	Net Value of Deposit.
ozs.	d.	£ s. d.	£ s. d.
50	2.5	0 10 5	194 3 4
100	2.5	1 0 10	388 6 8
600	2.3	5 16 8	2,330 8 4
1,000	2.0	8 6 8	3,885 8 4
5,000	1.6	33 6 8	19,435 8 4
10,000	1.55	64 11 8	38,872 18 4

NOTE.—A proportion of silver in deposits of gold is paid for by the Mint as follows:—

In deposits under 1,000ozs. gross: all silver in excess of 8 per cent. of the weight of the deposit after melting.
" from 1,000 " to 5,000 " " 6 " " " " "
" " 5,000 " " 10,000 " " 5 " " " " "
" " 10,000 " upwards " " 4 " " " " "

The rate at which payment for silver is made is liable to fluctuation.

RATES FOR CARRIAGE OF GOLD ON GOVERNMENT RAILWAYS.

	Distance not over—									
	10 miles.	25 miles.	50 miles.	100 miles.	150 miles.	200 miles.	250 miles.	300 miles.	400 miles.	500 miles.
Bullion or unmanufactured Gold, per 100 ozs. ...	s. d. 3 9	s. d. 4 6	s. d. 5 3	s. d. 6 9	s. d. 8 3	s. d. 9 9	s. d. 11 3	s. d. 12 9	s. d. 15 0	s. d. 17 3

1s. 6d. per 100ozs. for every additional 100 miles or part thereof.

Consignments of Gold Bullion in lots exceeding in the aggregate 30,000 ozs. despatched on any one day will be allowed a reduction of 33⅓ per cent. with a minimum charge as for 30,000 ozs. Consignors may combine to make up the required quantity, but each consignment must be charged for separately.

To find the value per ounce of gold sent from a mine to the Mint.—Divide the standard gold by the weight before melting, and multiply the result by £3 17s. 10½d. For instance, supposing the Mint return to show:—

	Ozs.
Weight before melting	47.41
Standard gold	38.19

The calculation would be as follows:—

4741)3819.0(.805
3792.8
26200
23705
2495

.805 × £3 17s. 10½d. =
.805 × £3.894
.805
19470
311520
£3.134(670)
20
s. 2.680
12
d. 8.160 = £3 2s. 8d., value per ounce of gold as produced, at the mine.

By Authority: FRED. WM. SIMPSON, Government Printer, Perth.